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The
University of Minnesota
Bulletin

The Graduate School

1908-1909

Volume XI

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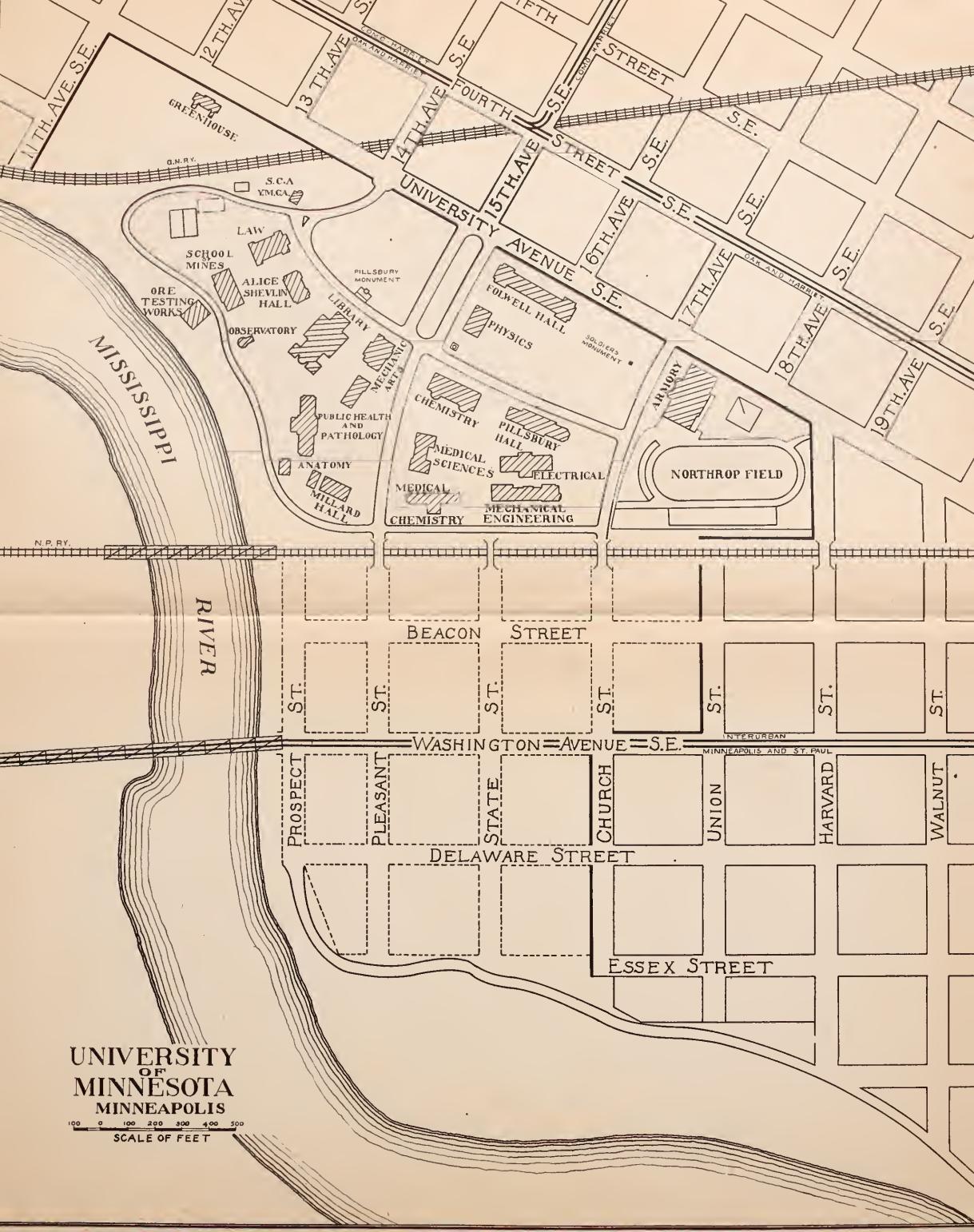
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The University catalogues are published by authority of the Board of Regents, as a regular series of bulletins. One bulletin for each college is published every year, and in addition a bulletin of general information outlining the entrance requirements of all colleges of the University, and embodying such items as University equipment, organizations and publications, expenses of students, loan and trust funds, scholarships, prizes, etc. Bulletins will be sent gratuitously, postage paid, to all persons who apply for them. In calling for bulletins, please state the college or school of the University concerning which information is desired. Address,

THE REGISTRAR,

The University of Minnesota,

Minneapolis, Minnesota



CALENDAR FOR 1908-1909

1908

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University Calendar

1907-1908

THE UNIVERSITY YEAR

The University year covers a period of thirty-eight weeks beginning on the second Tuesday in September. Commencement day is always the second Thursday in June.

FEBRUARY	4 T	Second semester begins—classes called for regular work
	12 W	Lincoln's birthday—legal holiday
APRIL	22. S	Washington's birthday—legal holiday
MAY	17 F	Good Friday. Recess two days
	2 Th	Regular meeting Board of Regents
	25 M	Senior examinations begin
JUNE	30 S	Decoration Day—legal holiday
	1 M	Semester examinations begin
	6 S	Semester examinations close

COMMENCEMENT WEEK, 1908

SUNDAY	June 7	Baccalaureate service
MONDAY	June 8	Senior class exercises
TUESDAY	June 9	Phi Beta Kappa address. Senior promenade
WEDNESDAY	June 10	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 11	Commencement Day. The thirty-sixth annual commencement
FRIDAY	June 12	Summer vacation begins

1908-1909

SEPTEMBER	7-14	Entrance examinations, condition examinations and registration
	15 T	Classes called for regular work. Seventeenth annual session
OCTOBER	1 Th	Regular meeting Board of Regents
	5 M	Regular meeting University Council. Opening day, School of Agriculture
NOVEMBER	26 Th	Thanksgiving Day. Recess three days
DECEMBER	7 M	Regular meeting University Council
	8 T	Annual meeting Board of Regents
	19 S	Holiday recess begins (no classes)
JANUARY	5 T	Work resumed in all departments
	23 S	Semester examinations begin
FEBRUARY	30 S	Semester examinations close
	2 T	Second semester begins—classes called for regular work
	12 F	Lincoln's birthday—legal holiday
APRIL	22 M	Washington's birthday—legal holiday
	5 M	Regular meeting University Council
	9 F	Good Friday. Recess two days

MAY	6 Th	Regular meeting Board of Regents
	24 M	Senior examinations begin
JUNE	31 M	Decoration Day—legal holiday
	1 T	Semester examinations begin
	5 S	Semester examinations close
	7 M	Regular meeting University Council

COMMENCEMENT WEEK, 1909

SUNDAY	June 6	Baccalaureate service
MONDAY	June 7	Senior class exercises
TUESDAY	June 8	Sigma Xi address. Senior promenade
WEDNESDAY	June 9	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 10	Commencement Day. The thirty-seventh annual commencement
FRIDAY	June 11	Summer vacation begins

PROGRAM—ENTRANCE EXAMINATIONS

MONDAY,	September 7, 9 A. M.	3 Botany 3 Zoology 1 Astronomy 3 Geology 2 P. M. 2 American Government 2 Political Economy
TUESDAY,	September 8, 9 A. M.	2 History 5 Physics 2 P. M. 4 Chemistry 3 Physiography
WEDNESDAY,	September 9, 9 A. M.	1 English 2 P. M. 1 German 1 French 1 Latin 1 Scandinavian
THURSDAY,	September 10, 9 A. M.	1 Elementary Algebra 2 Commercial Geography
FRIDAY,	September 11, 9 A. M.	2 P. M. 1 Higher Algebra 1 Plane Geometry 2 P. M. 1 Solid Geometry

1 Folwell Hall, 2 Library Building, 3 Pillsbury Hall, 4 Chemical Laboratory, 5 Physics Building, 6 Mechanic Arts Building.

PROGRAM OF CONDITION EXAMINATIONS

TUESDAY,	September 8, 9 A. M.	English, Rhetoric, Sociology 2 P. M. Mathematics, Philosophy, Psychology
WEDNESDAY,	September 9, 9 A. M.	Animal Biology, Botany, Geology, Physics
THURSDAY,	September 10, 9 A. M.	2 P. M. Astronomy, Chemistry, Economics, Drawing French, German, Greek, Scandinavian 2 P. M. History, Latin, Education, Politics

For notice of the class-rooms in which these examinations will be given, see bulletin in library building.
The school year for 1909-10 will begin Tuesday, Sept. 14.

The University

THE UNIVERSITY OF MINNESOTA comprises the following named schools, colleges and departments:

THE COLLEGE OF SCIENCE, LITERATURE AND THE ARTS

THE COLLEGE OF ENGINEERING AND THE MECHANIC ARTS

THE DEPARTMENT OF AGRICULTURE, including—

The College of Agriculture

The School of Agriculture

Short Course for Farmers

The Dairy School

The Crookston School of Agriculture

THE COLLEGE OF LAW

THE COLLEGE OF MEDICINE AND SURGERY

THE COLLEGE OF HOMEOPATHIC MEDICINE AND SURGERY

THE COLLEGE OF DENTISTRY

THE COLLEGE OF PHARMACY

THE SCHOOL OF MINES

THE SCHOOL OF ANALYTICAL AND APPLIED CHEMISTRY

THE COLLEGE OF EDUCATION

THE GRADUATE SCHOOL

The Regents of the University have entrusted to their charge:

THE EXPERIMENT STATIONS, including—

The Main Station at St. Anthony Park

The Sub-Station at Crookston

The Sub-Station at Grand Rapids

THE GEOLOGICAL AND NATURAL HISTORY SURVEY

Bulletins of these schools, colleges and departments may be obtained upon application to the University Registrar.

IN THE COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS, there is a four-year course of study leading to the degree, Bachelor of Arts. The work of the first year is elective within certain limitations as to the range of subjects from which the electives may be chosen. The remaining work of the course is entirely elective, with the provision that a certain number of long courses be selected. The course is so elastic that it permits the student to make the general scope of his course classic, scientific or literary, to suit his individual purpose.

THE COLLEGE OF ENGINEERING AND THE MECHANIC ARTS offers courses of study, of four years each, in civil, mechanical, electrical and municipal engineering, leading to the degrees of Civil, Mechanical, and Electrical Engineer. This college offers a four-year course of study in science and technology, leading to the degree of Bachelor of Science, with an additional year leading to the engineer's degree in any one of the various lines offered in the college. This college also offers graduate work leading to the degree, Master of Science.

THE SCHOOL OF MINES offers four-year courses of study in mining and metallurgy upon completion of which the degrees, Engineer of Mines and Metallurgical Engineer, are conferred.

THE SCHOOL OF ANALYTICAL AND APPLIED CHEMISTRY, leading to the degrees, Bachelor of Science in Chemistry, and Bachelor of Science in Chemical Engineering, offers two courses of study of four years each in analytical and applied chemistry.

THE COLLEGE OF EDUCATION receives students who have completed two years of college work, and offers them a three-year course leading to the master's degree. At the end of the second year students may receive the bachelor's degree and the University teacher's certificate. Graduates of other colleges, who have pursued an equivalent course in education, may enter for the master's degree.

THE GRADUATE SCHOOL gathers into a single organization and unites for the purposes of administration all the activities of the University in all its schools and colleges in so far as they relate to advanced instruction offered for the second or higher degrees, viz.; Master of Arts and Doctor of Philosophy conferred for advanced, non-technical study; Master of Science and Doctor of Science for technical study; Master of Laws and Doctor of Civil Law for advanced legal studies. The privileges of this school are in general open to all Bachelors of Arts, of Science, pure and applied, and of Laws, from reputable colleges and universities having courses substantially equivalent to those at this University.

THE UNIVERSITY SUMMER SCHOOL is organized for a six weeks' session in June and July under the direction of the State Department of Public Instruction. In the elementary section courses are given for teachers in all the common school branches and in preparation for the state teacher's certificates. In the college section courses are given for high school teachers and in preparation for the state professional certificate. Students who desire University entrance credits and credits toward the bachelor's degree may secure these by pursuing not more than two full courses at each session.

SPECIAL COURSES. In each of the Colleges, students of mature age and adequate preparation are permitted to pursue, under the direction of the faculty, one or two distinct lines of study.

EXTENSION LECTURES. Professors in the University are prepared to give a limited number of extension lectures from time to time. For subjects, speakers, terms and dates, application should be made to the Chairman of the Committee on University Extension.

THE COLLEGE OF AGRICULTURE offers a four-year course in agriculture. The degree of Bachelor of Science, in Agriculture, is conferred upon completion of the course. Students in this College may specialize along the line of forestry or of home economics and secure the degree, Bachelor of Science (in Forestry, or in Home Economics).

THE SCHOOL OF AGRICULTURE offers a three-year course of study and is a training school for practical farm life and in domestic economy. The College of Agriculture is open to graduates of this School who have completed the fourth year of work required for admission to the college.

The Dairy School offers practical instruction in dairying, specially designed for those who are actually engaged in the manufacture of butter and cheese.

The Short Course for Farmers is designed to be of the greatest help possible to those actually engaged in farming.

The Crookston State School of Agriculture offers a course of study quite similar to that given in the School of Agriculture.

THE COLLEGE OF LAW offers a three-year course of instruction leading to the degree of Bachelor of Laws. Graduate work leading to the degrees, Master of Laws, and Doctor of Civil Law, is offered. An evening class is provided in this college.

THE COLLEGE OF MEDICINE AND SURGERY, AND THE COLLEGE OF HOMEOPATHIC MEDICINE AND SURGERY offer four-year courses of study, of nine months each, requiring two years of collegiate work for admission. Upon completion of either of the prescribed courses the degree, Doctor of Medicine, is conferred.

In the Colleges of Science, Literature and the Arts, of Medicine and Surgery, and of Homeopathic Medicine and Surgery, there has been established a combined course of six years, leading to the degrees, Bachelor of Science, and Doctor of Medicine.

THE COLLEGE OF DENTISTRY offers a three-year course of study, of nine months each. Upon completion of the prescribed course the degree of Doctor of Dental Surgery is conferred.

THE COLLEGE OF PHARMACY offers a two or three-year course of study leading to the degree of Pharmaceutical Chemist. This college also offers graduate work leading to the degrees, Master of Pharmacy and Doctor of Pharmacy.

The Board of Regents

CYRUS NORTHRUP, LL. D., MINNEAPOLIS	<i>Ex-Officio</i>
The President of the University	
The HON. JOHN LIND, MINNEAPOLIS	1914
The President of the Board	
The HON. JOHN A. JOHNSON, ST. PETER	<i>Ex-Officio</i>
The Governor of the State	
The HON. JOHN W. OLSEN, ALBERT LEA	<i>Ex-Officio</i>
The State Superintendent of Public Instruction	
The HON. THOMAS WILSON, ST. PAUL	1909
The HON. A. E. RICE, WILLMAR	1909
The HON. B. F. NELSON, MINNEAPOLIS	1910
The HON. PIERCE BUTLER, ST. PAUL	1910
The HON. CHARLES A. SMITH, MINNEAPOLIS	1910
The HON. S. M. OWEN, MINNEAPOLIS	1913
The HON. W. J. MAYO, ROCHESTER	1913
The HON. HENRY B. HOVLAND, DULUTH	1914

C. D. DECKER, MINNEAPOLIS
Secretary of the Board.

Executive Officers

THE UNIVERSITY

CYRUS NORTHRUP, LL. D., *President*

ERNEST B. PIERCE, B. A., *Registrar*

JAMES T. GEROULD, B. A., *Librarian*

C. D. DECKER, *Purchasing Agent*

J. D. BREN, *Cashier*

THE COLLEGES

JOHN F. DOWNEY, M. A., C. E., *Dean of the College of Science, Literature, and the Arts*

FREDERICK S. JONES, M. A., *Dean of the College of Engineering and the Mechanic Arts*

EUGENE W. RANDALL, *Dean and Director of the Department of Agriculture*

WILLIAM S. PATTEE, LL. D., *Dean of the College of Law*

FRANK FAIRCHILD WESBROOK, M. A., M. D., C. M., *Dean of the College of Medicine and Surgery*

EUGENE L. MANN, B. A., M. D., *Dean of the College of Homeopathic Medicine and Surgery*

ALFRED OWRE, D. M. D., M. D., *Dean of the College of Dentistry*

FREDERICK J. WULLING, Phm.D., LL.M., *Dean of the College of Pharmacy*

WILLIAM R. APPLEBY, M. A., *Dean of the School of Mines*

GEORGE B. FRANKFORTER, Ph. D., *Dean of the School of Chemistry*

GEORGE F. JAMES, Ph. D., *Dean of the School of Education*

HENRY T. EDDY, C.E., Ph. D., LL. D., *Dean of the Graduate School*

ADA L. COMSTOCK, M. A., *Dean of Women*

The University Council

At the regular meeting of the Board of Regents of the University, May 31st, 1905, a University Council was established according to the following plan:

I. The name of the body shall be The University Council. It shall consist of the President of the University, the deans of the various colleges and schools, one elected representative from each college or school for each 400 students or major fraction thereof, and one representative of the general alumni association.

II. The elected members shall serve for a period of one year. They shall be chosen from the various faculties at the time of the selection of standing committeees. The representative of the general alumni association shall be chosen by that body at its annual meeting from among the alumni who are not members of the University.

III. The Council shall be authorized to—

a) Appoint the following committeees or the faculty representation thereon:

The University auditing committee

The University press committee

The committee on athletics

The committee on University relations to other institutions of higher learning

The committee on health and sanitation

The committee on commencement and other University functions

The committee on catalogue, programs and courses of study

The committee on student entertainments and social affairs

And such other committeees as the general University interests may require

b) Receive reports from such committeees and to make such recommendations as may be required.

c) Consider and act upon any matter of general University interest beyond the province of a single faculty which may be referred to it by the President of the University or any faculty.

IV. The Council shall hold stated meetings upon the first Monday of October, December, April and June, and such other meetings as the President of the University may call

Representatives to the Council

The University

PRESIDENT CYRUS NORTHROP

The College of Science, Literature and the Arts

DEAN JOHN F. DOWNEY	PROFESSOR JOHN H. GRAY
PROFESSOR J. C. HUTCHINSON	PROFESSOR H. F. NACHTRIEB
	PROFESSOR NORMAN WILDE

The College of Engineering and the Mechanic Arts

DEAN FREDERICK S. JONES	PROFESSOR GEORGE D. SHEPARDSON
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The College and School of Agriculture

DEAN EUGENE W. RANDALL	PROFESSOR HARRY SNYDER
	PROFESSOR SAMUEL B. GREEN

The College of Law

DEAN WILLIAM S. PATTEE	PROFESSOR HENRY J. FLETCHER
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The College of Medicine and Surgery

DEAN F. F. WESBROOK	PROFESSOR THOMAS G. LEE
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The College of Homeopathic Medicine and Surgery

DEAN EUGENE L. MANN

The College of Dentistry

DEAN ALFRED OWRE

The College of Pharmacy

DEAN FREDERICK JOHN WULLING

The School of Mines

DEAN WILLIAM R. APPLEBY

The School of Chemistry

DEAN GEORGE B. FRANKFORTER

The College of Education

DEAN GEORGE F. JAMES

The Graduate School

DEAN HENRY T. EDDY

General Alumni Association

DAVID P. JONES

The Dean of Women

ADA L. COMSTOCK

University Council Committees

The University Auditing Committee

PROFESSORS ANDERSON, FLETCHER, OWRE, SIGERFOOS, SPRINGER

The Committee on Athletics

PROFESSORS PAIGE, BROOKE, HARDING, D. P. JONES, LITZENBERG

The Committee on Grounds and Sanitation

PROFESSORS FLATHER, BASS, BRACKEN, HICKMAN, RANDALL, SIDENER,
WESBROOK

The Committee on Catalogue, Programs and Course of Study

DEANS APPLEBY, EDDY, FRANKFORTER, JAMES, JONES, MANN, OWRE,
WULLING; PROFESSORS FLETCHER, JOHNSTON, SCHLENKER, SNYDER,
E. B. PIERCE

The Press Committee

PROFESSORS SCHAPER, BAUER, CONSTANT, ERDMANN, JAMES

The Committee on Commencement and other University Functions

PROFESSORS NACHTRIEB, JENKS, OWRE, PATTEE, RANDALL, SCHLENKER,
WASHBURN

The Committee on Student Entertainments and Social Affairs

PROFESSORS FRANKFORTER, BASS, COMSTOCK, COOKE, MULLEN, PIKE

The Committee on University Relations to other Institutions of Higher Learning

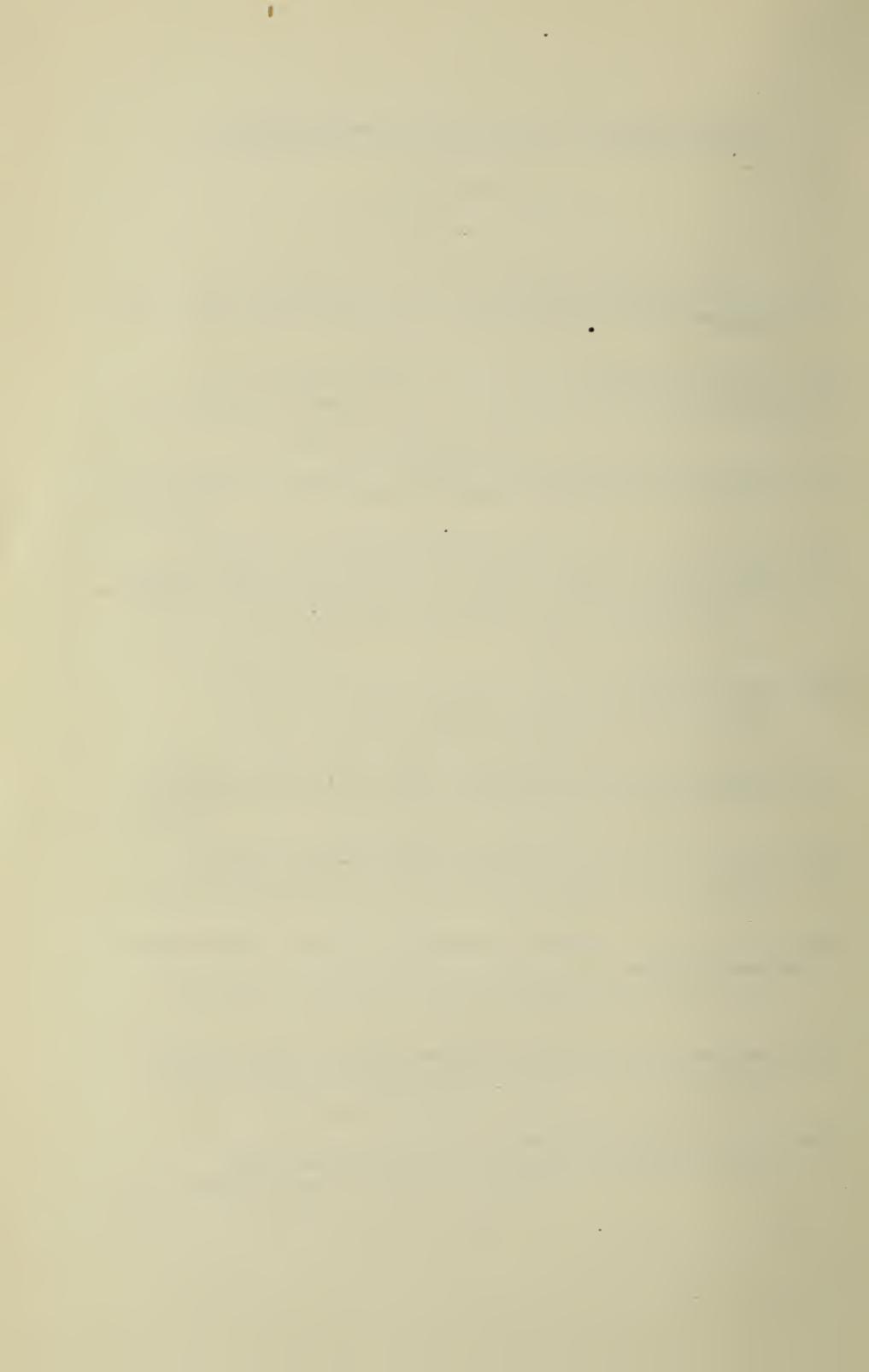
PROFESSORS DOWNEY, BOTHNE, EDDY, GRAY, GREEN, JAMES, LEE

The Committee on University Extension and University Lectures

PROFESSORS WEST, HAECKER, RANKIN, SCHLENKER, SHEPARDSON

The Committee on the Library

PROFESSORS EDDY, FLETCHER, F. S. JONES, LEE, REYNOLDS,
VAN BARNEVELD, WEST



The Graduate School

FACULTY

CYRUS NORTHRUP, LL.D., <i>President</i>	519 Tenth Avenue S. E.
HENRY T. EDDY, C. E., Ph. D., LL. D. <i>Dean of the Graduate School, and Professor of Mathematics and Mechanics, College of Engineering and the Mechanic Arts.</i>	916 Sixth Street, S. E.
CEPHAS D. ALLIN, M. A., LL. B., <i>Instructor in Political Science.</i>	Minneapolis
FRANK MALOY ANDERSON, M.A., <i>Professor of History.</i>	1629 University Avenue, S. E.
CHARLES W. BENTON, M.A., Litt.D., <i>Professor of the French Language and Literature.</i>	516 Ninth Avenue S. E.
ANDREW BOSS, <i>Professor of Agriculture and Animal Husbandry.</i>	St. Anthony Park
GISLE BOTHNE, M. A., <i>Associate Professor of Scandinavian Languages and Literature.</i>	934 Fifteenth Avenue S. E.
JABEZ BROOKS, D.D., <i>Senior Professor of the Greek Language and Literature.</i>	1708 Laurel Avenue
RICHARD BURTON, Ph.D., <i>Professor of English Literature.</i>	Hampton Apartments
JOHN S. CLARK, B.A., <i>Professor of the Latin Language and Literature.</i>	729 Tenth Avenue S. E.
F. R. CLEMENTS, Ph.D., <i>Professor of Botany.</i>	Minneapolis
FRANK H. CONSTANT, C.E., <i>Professor of Structural Engineering.</i>	1803 University Avenue S. E.
JOHN L. COULTER, M. A., <i>Instructor in Economics.</i>	Minneapolis
SAMUEL N. DEINARD, M.A., <i>Assistant Professor of the Semitic Languages and Literatures.</i>	Minneapolis
JOHN F. DOWNEY, M.A., C.E., <i>Dean of the College of Science, Literature and the Arts, and Professor of Mathematics.</i>	825 Fifth Street S. E.
HENRY A. ERICKSON, Ph. D., <i>Assistant Professor of Physics.</i>	Minneapolis
OSCAR W. FIRKINS, M. A., <i>Instructor in Rhetoric.</i>	1528 4th Street S. E.

JOHN J. FLATHER, Ph.B., M.M.E., <i>Professor of Mechanical Engineering.</i>	1103 Fourth Street S. E.
GEORGE B. FRANKFORTER, M.A., Ph.D., <i>Dean of the School of Chemistry, and Professor of Chemistry.</i>	525 River Road, S. E.
EDWARD M. FREEMAN, M. S., Ph. D., <i>Assistant Professor of Botany.</i>	St. Anthony Park
JOHN E. GRANRUD, Ph.D., <i>Assistant Professor of Latin.</i>	605 Delaware Street S. E.
J. H. GRAY, Ph.D., <i>Professor of Economics and Politics.</i>	412 Walnut Street, S. E.
SAMUEL B. GREEN, B.S., <i>Professor of Horticulture and Forestry, and Horticulturist of the Experiment Station.</i>	St. Anthony Park
T. L. HAECKER, <i>Professor of Dairy Husbandry.</i>	St. Anthony Park
CHRISTOPHER W. HALL, M.A., <i>Professor of Geology and Mineralogy; Curator of the Geological Museum.</i>	803 University Avenue S. E.
ARTHUR EDWIN HAYNES, M.S., M.Ph., Sc.D., <i>Professor of Engineering Mathematics.</i>	703 River Parkway
JOHN C. HUTCHINSON, B.A., <i>Professor of the Greek Language and Literature.</i>	3806 Blaisdell Avenue
GEORGE FRANCIS JAMES, Ph.D., <i>Dean of the College of Education, and Professor of Education.</i>	308 Eighteenth Avenue, S. E.
ALBERT ERNEST JENKS, Ph. D., <i>Professor of Anthropology.</i>	313 Sixteenth Avenue S. E.
JOHN BLACK JOHNSTON, Ph. D., <i>Assistant Professor of the Anatomy of the Nervous System.</i>	509 St. Anthony Parkway
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WILLIAM H. KAVANAUGH, M.E., <i>Professor of Experimental Engineering.</i>	503 Fifteenth Avenue S. E.
WILLIAM H. KIRCHNER, B.S., <i>Professor of Drawing and Descriptive Geometry.</i>	217 Beacon Street
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JAMES BURT MINER, Ph.D., <i>Assistant Professor of Psychology.</i>	1319 Fifth Street S. E.

JOHN G. MOORE, B.A.,	2810 University Avenue S. E.
<i>Professor of the German Language and Literature.</i>	
W. S. NICKERSON, Sc. D., M. D.,	217 Beacon Street S. E.
<i>Assistant Professor of Histology and Embryology.</i>	
HENRY F. NACHTRIEB, B.S.,	905 Sixth Street S. E.
<i>Professor of Animal Biology; Zoologist of the Geological and Natural History Survey; Curator of the Zoological Museum.</i>	
OSCAR W. OESTLUND, M.A.,	1910 Fourth Street S. E.
<i>Assistant Professor of Animal Biology.</i>	
WILLIAM S. PATTEE, LL.D.,	1319 Fifth Street S. E.
<i>Dean of the College of Law, and Professor of Equity and In- ternational Law.</i>	
MARY GRAY PECK, M.A.,	2412 Harriet Avenue
<i>Assistant Professor of English.</i>	
RAYMOND V. PHELAN, Ph. D.	1629 University Avenue, S. E.
<i>Instructor in Economics.</i>	
JOSEPH BROWN PIKE, M.A.,	525 Tenth Avenue S. E.
<i>Professor of Latin.</i>	
FRANCES S. POTTER, M.A.,	2412 Harriet Avenue
<i>Professor of English.</i>	
BENJAMIN M. ROSTALL, Ph. D.,	Minneapolis
<i>Assistant Professor of Economics.</i>	
ALBERT W. RANKIN, A.B.,	916 Fifth Street S. E.
<i>Associate Professor of Education.</i>	
M. H. REYNOLDS, M.D., V.M.,	St. Anthony Park
<i>Professor of Veterinary Medicine and Surgery and Veterinarian of the Experiment Station.</i>	
E. V. ROBINSON, Ph.D.,	1213 Seventh Street, S. E.
<i>Professor of Economics and Politics.</i>	
C. O. ROSENDAHL, Ph.D.,	626 Sixteenth Avenue S. E.
<i>Assistant Professor of Botany.</i>	
FREDERICK W. SARDESON, Ph.D.,	414 Harvard Street
<i>Assistant Professor of Paleontology.</i>	
CHARLES ALBERT SAVAGE, Ph.D.,	1100 Fifth Street, S. E.
<i>Assistant Professor of Greek.</i>	
WILLIAM A. SCHAPER, Ph.D.,	1009 University Avenue S. E.
<i>Professor of Political Science.</i>	
CARL SCHLENKER, B.A.,	422 Union Street, S. E.
<i>Professor of German.</i>	
GEORGE D. SHEPARDSON, A.M., M.E.,	Minneapolis
<i>Professor of Electrical Engineering.</i>	

CHARLES F. SIDENER, B.S., <i>Professor of Chemistry.</i>	1320 Fifth Street S. E.
CHARLES P. SIGERFOOS, Ph.D., <i>Professor of Zoology.</i>	1206 Fifth Street S. E.
SAMUEL G. SMITH, Ph.D., LL.D., <i>Professor of Sociology.</i>	St. Paul
HARRY SNYDER, B.S., <i>Professor of Agricultural Chemistry, and Chemist of the Experiment Station.</i>	St. Anthony Park
FRANK W. SPRINGER, E.E., <i>Assistant Professor of Electrical Engineering.</i>	1100 Fifth Street S. E.
ANDREW ADIN STOMBERG, M. A., <i>Professor of Scandinavian Languages and Literature.</i>	709 Delaware Street, S. E.
DAVID F. SWENSON, B.S., <i>Assistant Professor of Philosophy.</i>	3101 Sixteenth Avenue S.
JOSEPHINE E. TILDEN, M.S., <i>Assistant Professor of Botany.</i>	800 Fourth Street, S. E.
FREDERICK L. WASHBURN, M.A., <i>Professor of Entomology, and Entomologist of the Experiment Station; State Entomologist.</i>	St. Anthony Park
WILLIS M. WEST, M.A., <i>Professor of History.</i>	1314 Sixth Street S. E.
FRANK F. WESBROOK, M.A., M.D., C.M., <i>Dean of the College of Medicine and Surgery; Professor of Pathology and Bacteriology.</i>	328 Tenth Avenue S. E.
ALBERT B. WHITE, Ph.D., <i>Professor of History.</i>	515 Fifteenth Avenue S. E.
NORMAN WILDE, Ph.D., <i>Professor of Philosophy and Psychology.</i>	910 Sixth Street S. E.
FREDERICK J. WULLING, Ph.G., Phar.D., LL.M., <i>Dean and Professor of Pharmacology, Pharmaceutical Chemistry, and Pharmacal Jurisprudence, College of Pharmacy.</i>	3305 Second Avenue S.
ANTHONY ZELENY, Ph. D., <i>Assistant Professor of Physics.</i>	321 Church Street, S. E.
JOHN ZELENY, Ph.D., <i>Professor of Physics.</i>	Minneapolis

The Graduate School

The graduate school has been established by the Board of Regents to include in a single organization the graduate work of all colleges and schools of the University, which offer courses of instruction leading to the higher degrees. The administration of the school is entrusted to the Dean, who is charged with its supervision and regulation, under the general direction of the President.

The faculty of the school consists of all those professors in the University who give courses of instruction accepted for such higher degrees as are offered by the school. Each college of the University has its graduate committee.

The Dean is chairman of the faculty and of the graduate committees of the various colleges, *ex officio*.

Regular faculty meetings will be held on the second Friday of each semester and on the last Friday of the year, and they may also be called by the Dean at such other times as business may demand.

The aim of the school is to offer instruction and opportunity for study combined with facilities for investigation and research to graduate students who desire to pursue some one or more branches of knowledge beyond the ordinary undergraduate courses.

FEES

All students taking full work in this school are required to pay a fee of ten dollars a semester, or a proportionate fee for less work. Members of the staff of instruction in the University may register for graduate work without payment of tuition fees. Laboratory fees are charged in addition to those just mentioned.

ADMISSION

Any graduate from a four years' course of study in any reputable college or university will be admitted to the graduate school without examination, but will not be thereby admitted to candidacy for either of the higher degrees until his case has been duly considered and approved, as is explained later, in connection with the several degrees.

Each applicant for admission to the school should present himself in person to the Registrar with his credentials (preferably his diploma of graduation), in order to register and pay his fees.

In case of doubt respecting the sufficiency of credentials, consult the Dean.

Registration at the beginning of each semester is obligatory upon graduate students and undergraduates alike.

Each student will receive at registration for entrance to the school a registration book in which to inscribe the courses he desires to pursue. When the instructors in charge of these courses shall have signed this book certifying that the student is prepared to begin such courses and when the Dean shall have approved this choice, the Registrar will issue cards authorizing the student to attend the courses thus certified to. Upon the successful completion of such work the instructors shall again sign the registration book. The student shall retain his book until ready for final examination, when he shall present it to the chairman of the examining committee. The action of the committee shall be recorded thereon and the book be deposited with the Registrar for record.

DEGREES

The degree of Master of Arts is, in general, conferred for advanced non-technical study; the degree of Master of Science for advanced technical study, such as agriculture, industrial chemistry, engineering, etc.; and Master of Laws for advanced legal studies.

The Master's Degree. Three degrees of this grade are conferred, viz.: Master of Arts (M.A.), Master of Science (M.S.), and Master of Laws (LL.M.).

Candidacy for the Master's Degree. Any bachelor, a graduate of this University or of any other university or college with an equivalent baccalaureate course, will be enrolled by the Dean as a candidate for the corresponding master's degree on the basis of an approved course of study conforming to requirements detailed below, provided the heads of the departments in which the studies selected lie, signify their approval of the student's preparation to enter upon the work selected.

In case of inadequate preparation for the work selected, such preliminary study as the case may require will be stated by the professor in charge and will be insisted on before the applicant is admitted to candidacy.

Regulations. The master's degree will be conferred on any candidate enrolled for that degree, who not sooner than one year after graduation if in residence at the University, and not sooner than two years after registration if not in residence, shall pass satisfactory final examinations on the course which was approved when he was admitted to candidacy, and shall in addition present an acceptable thesis in accordance with the following provisions:

The professor with whom the candidate pursues his major subject shall be chairman of a committee of three, having in charge the work of the candidate from the time of his enrollment as such, the other members of the committee being those professors under whom the candidate's minors fall. This committee shall arrange for and have charge of the final examinations of the candidate; they shall approve the subject of the thesis, and pass upon the thesis itself. The candidate must secure their approval of his subject at least three months before graduation, and must complete the thesis and all examinations at least two weeks before graduation. All candidates for the master's degree shall pass written examinations upon all work taken by them, time and place to be determined by the committee. If these examinations and the thesis are satisfactory, the candidate shall be admitted to a final oral examination before the committee. It shall be the duty of this committee to canvass the examinations of the candidate's whole course together with the thesis, and in case they regard him entitled to a degree, to report the fact to the Dean, at least one week before commencement. The chairman of the committee shall also make a final report upon the candidate to the Registrar one week before commencement.

Any candidate for master's degree at commencement must, as a preliminary, make application to the Dean in writing, by the first of the preceding May, and state the courses in which he has passed and is to pass examination, the title of his thesis, and the names of the committee in charge of his work.

The amount of work required for the master's degree shall be equivalent to that done by the senior class. Proficiency shall be determined by examination upon the subject matter of the courses taken and of the thesis.

For convenience in selecting among the various departments and subjects of study they are arranged in groups, as follows:

1. Education, Philosophy, Psychology, Sociology.
2. Economics, History, Law, Political Science.
3. Greek, Latin, Sanscrit, and Semitic languages and literatures.
4. Comparative Philology, English, Germanic, Romance, and Scandinavian languages and literatures.
5. Anatomy, Animal Biology, Bacteriology, Botany, Embryology, Histology, Paleontology, Physiology.
6. Agriculture, Chemistry, Geology, Mineralogy.
7. Astronomy, Engineering, Mathematics, Mechanics, Physics.

Candidates desiring a master's degree in some special line of study, for the purpose of teaching or research, or as a basis for studies leading to the doctor's degree, must select three subjects of study, a major to occupy at least one-half of the work required, a first minor to occupy one fourth, which shall be germane to the major subject by being selected from the same group or a closely related group, and a second minor to

complete the work required, which last shall be in some reasonable connection with the other subjects selected. In special cases the candidate may be allowed to fill the required time with a major and one minor only. The thesis in this case must embody the results of study and investigation along the line of the major subject. In attaining this specialized master's degree, the thesis is regarded of much importance, and to it the candidate should devote much time and effort. To render this possible, the professor in charge of the major subject may count work assigned in its preparation as part of the time required in that subject.

Candidates desiring a master's degree with a view to general culture will select subjects from three distinct groups, of which the work in no one group shall be less than four hours a week, for the year. The work in one of these groups shall be designated as the candidate's major and to it the subject of his thesis shall stand in close relation. The courses pursued in the major shall be in advance of any regularly pursued by undergraduates.

All theses must be written in satisfactory English and those accepted for the degree of M. S. and M. A. shall be filed with the librarian of the University for cataloguing before distribution to departmental libraries.

Theses for all degrees in the graduate school shall be typewritten on one side only of the sheet, on paper of good linen stock measuring eight and one-half by eleven inches, and shall have a margin of one and one-quarter inches on all sides of the text. The title page of the thesis should be in the following form: (Title of the thesis). "A thesis submitted to the faculty of the Graduate School of the University of Minnesota by (name in full) in partial fulfillment of the requirements for the degree of (name of the degree in full), (date)."

A candidate for the degree of Master of Laws must not only be Bachelor of Laws from a reputable law college having a course equivalent in length to that at the University of Minnesota, but he must in addition have been admitted to the bar in Minnesota. Any person who possesses the requisite legal learning may on registration pursue any or all of the studies offered for this degree, but he thereby acquires no standing as candidate for this degree.

The major selected for this degree will in all cases be Law, and the minors, Political Science and Constitutional History.

The Doctor's Degree. Three degrees of this grade are conferred, viz.: Doctor of Philosophy (Ph. D.), Doctor of Science (Sc. D.), and Doctor of Civil Law (D. C. L.), for still more advanced study than that leading to the corresponding bachelor's and master's degrees, and such special attainments therein as show power of original investigation and independent research, together with a fair degree of literary skill as evinced by the preparation of a thesis which shall be a contribution to knowledge.

Candidacy for the Degree of Doctor. Any student in the Graduate School who applies to be enrolled as candidate for a doctor's degree must, in order to be enrolled as such, possess a reading knowledge of French and German, certified to by the professors respectively in charge of those languages, and in case of an applicant applying to be enrolled as candidate for the degree of Doctor of Civil Law, proficiency in Latin and Roman History is also required. Knowledge of Latin will also be required in certain other cases such as for a major in Medieval History, or Philosophy, as the professor in charge may prescribe.

The applicant must also have made before enrollment such noteworthy advancement in his graduate work as to secure the approval of his candidacy by his instructors. And in particular, he must obtain the written consent of the professor under whom his major subject falls to take charge of his instruction in that subject. His minors must also be acceptable to this professor, who must recommend him to the dean as a suitable candidate for the degree sought.

In order for the applicant to be successful, this professor should also state that, through the work thus far accomplished by the applicant, he has become convinced of his capacity and of his probable ability to carry an investigation in his special field to a successful conclusion and embody it in a valuable thesis.

The Dean shall, after full consideration and consultation with the professor concerned, pass upon his application and have power to enroll the applicant as candidate or refuse to do so. Such enrollment as candidate must be secured at least one year before the degree will be conferred.

It will frequently not be practicable to enroll an applicant as candidate for the doctor's degree before the completion of one year's study in the Graduate School. Graduates desiring to become candidates for this degree will find it advisable, under ordinary circumstances, to spend the first year of graduate study in attaining to the specialized master's degree, as part of the work leading to the doctor's degree.

That procedure is likely to furnish such a decisive test of capacity for advanced study, as well as experience in preparation of a thesis, as to settle definitely the question of candidacy for the doctor's degree.

Candidates for the degree of Doctor of Civil Law are required to secure the degree of Master of Laws as a preliminary.

Regulations. Candidates for the degree of doctor must devote at least three years of graduate study to the subjects approved for candidacy, of which the last year must be spent in residence at the University of Minnesota. In lieu of the other years the candidate may offer an equivalent term of graduate study at some other university, but study pursued and work done *in absentia* without proper facilities of libraries and laboratories will not be accepted.

The same general regulations govern the candidate for this degree as hold in case of the specialized master's degree, both as regards the amount of study per year, the selection and relative amount of major and minors and as regards the chairman of the committee in charge of the work of the candidate, as well as regards the thesis required, which for this degree must give evidence of original and independent research and must be a contribution to knowledge.

In particular, considerable portions of the work on the major and on the thesis may be carried on under general direction of the professor in charge, in which case the candidate will be held responsible for large attainments in the directions indicated, in the form of written reports, reviews and criticism.

The candidate must pass satisfactory written examinations upon his major and minor subjects at any time not more than a year prior to the final examination on the major.

In the case of the minors this written examination shall be final. If these examinations are satisfactory and the thesis approved the candidate shall be admitted to a final oral examination upon his major.

The final examination upon the major must show an exhaustive knowledge of the special subject selected, and a large acquaintance with the general field in which the subject lies, but the candidate shall not be admitted to the final examination upon his major until his thesis has been considered by the committee in charge and found satisfactory.

The order of procedure to be followed is this: The candidate for a doctor's degree shall submit the title and outline of his proposed thesis to the professor in charge of his major for final approval at least as early as the first of October preceding the commencement at which the degree is to be conferred. In case the proposed subject and the outline are acceptable, the candidate shall make a statement in writing to the Dean, as early as the first of the following February, of his intention to present himself for a doctor's degree at the next commencement, giving at the same time the names of the committee in charge of his work, the subjects of his major and minors, and the title of his thesis.

The thesis itself shall be completed in the typewritten form previously prescribed, and delivered to the professor in charge at least one month before commencement. In case the thesis is adjudged satisfactory, the candidate will be admitted by the committee to final examinations upon his major and upon the subject matter of his thesis.

This examination shall be arranged for by the professor in charge of the major, on a date at least two weeks before commencement. It shall be held by a committee of examination of which the professor in charge of the major shall be chairman, consisting of the professors in charge of the minors and, in addition, of such other members of the teaching force as

the Dean may appoint as members of this examining committee. In order to do this, the Dean shall be duly informed of the date of the examination by the chairman.

The examining committee shall decide from all the facts within its knowledge, whether the candidate is, in its estimation, entitled to receive the doctor's degree sought, and the chairman shall, without delay, report its findings, in writing, to the Dean and to the Registrar.

Immediately after the final examination, the thesis shall be placed by the chairman in the president's office for general examination, and finally deposited with the librarian.

In case the report of the committee is favorable, the candidate shall be presented to the faculty of the graduate school, at a meeting called for the purpose, by the professor in charge of his major subject, who shall then make a written statement of the academic life of the candidate, of the character and scope of his examinations, and the scope and value of his thesis.

Any member of the faculty shall then be at liberty to propound any questions he will to the instructors of the candidate, respecting his work, or to the candidate himself, respecting the subject matter of his thesis. Upon evidence before it, the faculty shall then decide by vote whether the candidate shall be recommended for the degree.

Courses of Instruction

The Arabic numerals by which the courses are here designated are those under which they appear in the bulletins of the separate colleges.

The courses which are offered to both undergraduates and graduates may not be selected by graduates as major subjects, but as minors only. The courses offered primarily for graduates include the subjects offered to them as majors.

AGRICULTURE

PLANT BREEDING—FIELD CROPS

ASSISTANT PROFESSOR BULL

Courses in this subject will include research along such lines as may be advisable, in view of the previous training of the student, the available material and facilities for instruction, and the object sought by the candidate.

The prominent features of the course will be a study of history and methods; laws of evolution, heredity, etc.; probabilities, hybridization, selection; nursery and plant manipulation; character plotting; plant economics.

Open to candidates for advanced degrees who have completed a long course in botany and agriculture 1 or their equivalent.

FARM MANAGEMENT

MR. WILSON

Reading and research work combined with occasional lectures. Those who wish may choose any subject or problem of farm management that is of personal interest, provided they can get the necessary material for study. Any problem related to farming may be chosen, and must be presented from a practical business standpoint with special reference to profit and loss on the farm. Open as major subject to candidates for advanced degree.

ANIMAL HUSBANDRY

ANIMAL FEEDING AND NUTRITION

PROFESSOR BOSS

Original investigations in animal feeding with studies of food requirements for maintenance and growth. Problems will be arranged to suit the training and needs of the individual student.

MEATS—STRUCTURE—COMPOSITION AND PREPARATION FOR USE

PROFESSOR BOSS AND ASSISTANT PROFESSOR GAUMNITZ

A course in which special consideration is given to the structure and composition of meats and to processes of ripening and curing them for food purposes. Original investigations will be required and equipment and material furnished for extensive study in this line.

ANIMAL BIOLOGY

Graduates, whether candidates for a degree or not, will be admitted to any line of research or advanced work that can be carried on profitably.

Less advanced graduates will be admitted to any regular classes of the department for which they are sufficiently prepared.

All advanced students are expected to take an active part in the Journal Club and the Biological Club.

Students who contemplate taking advanced work are advised to confer with the head of the department.

10. **HISTORY OF ZOOLOGY** PROFESSOR NACHTRIEB
Two credits (two hours per week) First semester
Open to juniors and seniors; students are advised to complete course 1 before electing this course; not offered in 1908-9.

A course of lectures on the history of zoology from ancient times to the present, including a brief history of our domestic animals and those that have become extinct within historic times, and a discussion of the modern theories and problems of heredity and evolution.

11. **ANIMAL HABITS AND INTELLIGENCE** PROFESSOR NACHTRIEB
Two credits (two hours per week) Second semester
Open to juniors and seniors; students are advised to complete course 1 before electing this course; alternates with course twelve.

The course consists of lectures and discussions on animal habits and intelligence, and concludes with a consideration of the development of mental power in animals.

12. **ECONOMIC ZOOLOGY** PROFESSOR NACHTRIEB
Two credits (two hours per week) Second semester
Open to juniors and seniors; alternates with course 11; not given in 1908-9.

Lectures on the uses made of animals and their products, the production and protection of those animals of special economic importance, and the methods of protection against some of the disease-producing animals.

13. **TEACHERS' COURSE** PROFESSOR NACHTRIEB AND ASSISTANTS
One credit (one hour per week) First semester
Open to those who have completed a minor in zoology; given in alternate years.

Lectures and discussions on the ends to be attained through courses in general zoology and the methods and means by which such ends may be gained.

FOR GRADUATES

14. **PROBLEMS AND RESEARCH** PROFESSOR NACHTRIEB AND ASSISTANTS
Six or twelve credits (six or twelve hours per week) Both semesters
Open to those who have completed courses 1 and 3 or 1 and such other work as may be required by the instructor in charge; both semesters must be completed before credit is given for the first semester.

The course consists of advanced or essentially independent work carried on in some specific line under the direction of the professor in charge of that work. The lines of work open at present are:

- (a) Morphology of vertebrates under Assistant Professor Brown
- (b) Blood, connective tissue and excretory organs of vertebrates under Assistant Professor Downey
- (c) Entomology under Assistant Professor Oestlund
- (d) Experimental zoology
- (e) General physiology under Professor Nachtrieb
- (f) Invertebrate embryology under Professor Sigerfoos
- (g) Invertebrate morphology under Professor Sigerfoos
- (h) Vertebrate embryology or morphology under Professor Nachtrieb.

ASTRONOMY

FOR UNDERGRADUATES AND GRADUATES

2. **PRACTICAL ASTRONOMY** PROFESSOR LEAVENWORTH
Six or twelve credits (three or six hours per week) Both semesters
Open to juniors and seniors who have completed course 1 and mathematics 5, 6, and 7.

Theory and use of astronomical instruments in determining time, latitude, longitude, positions of heavenly bodies; astronomical photography, with measures of plates; study of the method of least squares.

FOR GRADUATES

3. ADVANCED PRACTICAL ASTRONOMY	PROFESSOR LEAVENWORTH
Six credits (three hours per week)	Both semesters
Open to graduate students who have completed courses 1 and 2.	
4. CELESTIAL MECHANICS	PROFESSOR LEAVENWORTH
Six credits (three hours per week)	Both semesters
Open to graduate students who have completed courses 1 and 2.	
5. ASTROPHOTOGRAPHY	PROFESSOR LEAVENWORTH
Open to graduate students who have completed courses 1 and 2.	Both semesters
Photography of the heavenly bodies, measurement of plates, determination of positions, parallax, etc.	

BOTANY

Students entering the department for the first time must take course 1, or present a satisfactory equivalent. Courses 1 and 2 are required for entrance to all advanced courses, with the exception of eleven to fifteen. Students are requested to confer with the head of the department before electing an advanced course.

The Botanical Seminar consists of advanced students in botany, together with the staff of the department. It meets every two weeks for the presentation of the results of investigation, and for the discussion of current problems.

FOR UNDERGRADUATES AND GRADUATES

2. ADVANCED BOTANY	PROFESSOR CLEMENTS, ASSISTANT PROFESSORS
Six credits (six hours per week)	TILDEN AND ROSENDALH
Open to those who have completed course 1; the laboratory fee	Both semesters
is three dollars per semester.	

A study of the structure and classification of the great groups of plants, based on identification; the details of cell-division, of the formation of tissues and of reproduction; and the general relations of the plant to the physical factors of its home. Lectures and quizzes, laboratory, greenhouse and field work.

SPECIAL COURSES

3. PLANT PHYSIOLOGY AND ECOLOGY	PROFESSOR CLEMENTS AND MR. HUFF
Six credits (six hours per week)	Both semesters
Open to those who have completed courses 1 and 2; by permission of the department the course may be taken in conjunction with course 2; the laboratory fee is three dollars per semester.	
A study of the factors that affect the plant and its response to them; the adaptations of plants and the origin of new forms; the structure and development of vegetation, as shown in migration, invasion, competition, etc. Lectures and quizzes, greenhouse and field work.	
4. ALGAE	ASSISTANT PROFESSOR TILDEN
Six credits (six hours per week)	Both semesters
Open to those who have completed courses 1 and 2; the laboratory fee is three dollars per semester.	

A detailed comparative study of the structure and classification of the algae; the blue-green and yellow-green algae, together with a systematic examination of forms in the Minneapolis water supply, occupy the first semester, and the brown and the red marine algae the second semester. Lectures, laboratory and reference work.

5. FUNGI

Six credits (six hours per week)

Open to those who have completed courses 1 and 2; the laboratory fee is three dollars per semester.

PROFESSOR CLEMENTS

Both semesters

The classification and life-history of the various groups of fungi, based on identification, cultures and field work, with particular reference to forms which cause plant and animal diseases. Lectures and discussions, laboratory, greenhouse and field work.

6. MOSES AND FERNS

ASSISTANT PROFESSOR ROSEDAHL AND MR. HUFF

Six credits (six hours per week)

Both semesters

Open to those who have completed courses 1 and 2; the laboratory fee is three dollars per semester.

The course is designed for students who wish to pay special attention to the morphology and taxonomy of liverworts, mosses, and ferns. Lectures, laboratory and field work.

7. FLOWERING PLANTS

ASSISTANT PROFESSOR ROSEDAHL

Six credits (six hours per week)

Both semesters

Open to those who have completed courses 1 and 2; the laboratory fee is three dollars per semester.

The course is designed to afford the student an opportunity to become proficient in the determination of plant species and plant types, as well as to show the genetic development and relationships of the flowering plants. Lectures, reference reading, laboratory, greenhouse and herbarium work, together with field work in the fall and spring.

8. ECOLOGY

PROFESSOR CLEMENTS

Six credits (six hours per week)

Both semesters

Open to those who have completed course 1, 2 and 3; the laboratory fee is three dollars per semester.

A critical study of plant habitats by means of instruments, and the adaptations produced by water and by light, together with a careful examination of the causes and reactions of plant formations. Class discussions and quizzes, field and greenhouse work.

9. PLANT PHYSIOLOGY

PROFESSOR CLEMENTS

Six credits (six hours per week)

Both semesters

Open to those who have completed courses 1, 2 and 3; the laboratory fee is three dollars per semester; alternates with course 8.

A study of the relations of factor, function and structure in the various organs of the plant, with special reference to absorption, transpiration, photosynthesis, respiration, irritability and reproduction. Class discussions and quizzes, greenhouse and field work.

10. CYTOLOGY

ASSISTANT PROFESSOR ROSEDAHL

Six credits (six hours per week)

Both semesters

Open to those who have completed courses 1 and 2; the laboratory fee is three dollars per semester.

The course includes a survey of cell structure and the various phenomena of division, fusion and metamorphosis, together with a review of the history of cytologic investigation. Methods of cytological research indicated in the laboratory. Laboratory work and collateral reading.

11. INDUSTRIAL BOTANY

ASSISTANT PROFESSOR TILDEN

Six credits (six hours per week)

Both semesters

Open to technical students who have completed courses 1 and to academic students who have completed course 1 and 2; the laboratory fee is three dollars per semester.

A study of the origin, distribution and cultivation of plants yielding products of economic value, the nature and use of these products, and the processes by which they are obtained from the plants. Lectures, demonstrations, topics and laboratory work.

12. WOOD TECHNOLOGY PROFESSOR CLEMENTS AND MR. BUTTERS
 Six credits (six hours per week)
 Open to those who have had course 1; the laboratory fee is three dollars per semester.

A critical study of the most important woods, with especial reference to their structure, differences and uses and the life history and relationship of the various genera.

13. WATER SUPPLY BOTANY ASSISTANT PROFESSOR TILDEN
 Three credits (six hours per week) Second semester
 Open to those who have completed course 1; the laboratory fee is three dollars.

A technical course for municipal, sanitary and reclamation engineers involving the determination of the forms prevalent in storage waters and in water supplies, and their abundance, together with methods of control or prevention. Lectures and references, laboratory and field work.

14. TIMBER AND TIMBER DISEASES MR. HUFF
 Three credits (six hours per week) First semester
 Open to those who have completed course 1; the laboratory fee is three dollars.

A study of the source and structure of the important timbers with particular reference to their mechanical properties, together with a study of timber diseases, and methods of timber preservation. Lectures, laboratory work, and references.

15. BOTANICAL MICROCHEMISTRY PROFESSOR CLEMENTS
 Six credits (six hours per week) Both semesters
 Open to those who have completed course 1; laboratory fee is three dollars.

A microscopical study by means of stains and reagents of the nature and structure of plant substances, in the natural condition as well as in the finished product. Lectures, laboratory and reference work.

16. PLANT STUDIES AND METHODS PROFESSOR CLEMENTS
 Six credits (six hours per week) Both semesters
 Open to those who have completed courses 1 and 2; the laboratory fee is three dollars per semester.

A course for teachers and for students intending to teach; the subjects of nature study and high school botany are presented as they are to be taught and not from the university point of view; the material is taken up in detail in its proper sequence, and training in method is afforded as far as possible by practice in the elementary school of the College of Education.

FOR GRADUATES

17. MORPHOLOGY AND TAXONOMY ASSISTANT PROFESSOR ROSENDAHL
 Both semesters
 Open to graduate students; other arrangements may be ascertained upon application to the department.

Important literature and necessary material will be provided for whatever research is entered upon, and the results of the investigations will be required to be prepared for publication. The course is an elastic one and will be adapted to the special training and requirements of those pursuing it.

18. PROBLEMS IN ALGOLOGY ASSISTANT PROFESSOR TILDEN
 Both semesters
 Open to graduate students; other arrangements may be ascertained upon application to the department.

Research work may be done on special groups or along any of the following lines: The freshwater algae of Minnesota; the algae of the Minneapolis and St. Paul water supplies; the algae of hot springs; lime-depositing algae; arctic marine algae (material from Vancouver Island); tropical marine algae (material from the Hawaiian Islands). Special facilities for study are offered by the Minnesota Seaside Station on Vancouver Island, which is open during the summer vacation.

19. PROBLEMS IN PHYSIOLOGY AND ECOLOGY

PROFESSOR CLEMENTS
Both semesters

Open to graduate students; other arrangements may be ascertained upon application to the department.

Opportunity for research work in ecology and physiology is offered along the following lines: Critical investigation of the physical factors of the habitat by means of instruments; studies in plant functions and adaptations; the experimental production of new forms; investigations in the development and structure of vegetation, and especially in migration, competition, etc.

20. PROBLEMS IN CYTOLOGY AND EMBRYOLOGY

PROFESSOR CLEMENTS
Both semesters

Open to graduate students; other arrangements may be ascertained upon application to the department.

Research work may be taken along any of the following lines: The minute structure of the cell; microchemistry of the cell; development of sporangia and spores; fecundation; development of the embryo; origin and development of the primary tissues; development of organs; correlation, etc.

CHEMISTRY

FOR UNDERGRADUATES AND GRADUATES

4. QUANTITATIVE ANALYSIS (Gravimetric)

PROFESSOR SIDENER
First semesterThree credits (six hours per week)
Open to those who have completed course 3; the laboratory fee is five dollars.

Lectures and laboratory work. The course includes an introduction to quantitative and a beginning of gravimetric analysis.

5. QUANTITATIVE ANALYSIS (Volumetric)

PROFESSOR SIDENER
Second semesterThree credits (six hours per week)
Open to those who have completed course 4; the laboratory fee is five dollars.

Lectures and laboratory work. The course includes an introduction to volumetric analysis with a discussion of standard solutions and the necessary stoichiometric calculations.

6. ORGANIC CHEMISTRY

PROFESSOR FRANKFORTER, ASSISTANT
PROFESSORS DERBY AND HARDING
Both semesters

Six credits (six hours per week)

Open to those who have completed course 3.

Lectures and laboratory work. The course includes the aliphatic and aromatic series with a preparation of the more important compounds.

8. SPECIAL INORGANIC CHEMISTRY

Open to graduate students; other arrangements may be ascertained upon application to the department.

9. ELECTRO-CHEMISTRY

Open to graduate students; other arrangements may be ascertained upon application to the department.

10. ORGANIC CHEMISTRY

Open to graduate students; other arrangements may be ascertained upon application to the department.

11. THE ALKALOIDS

Open to graduate students; other arrangements may be ascertained upon application to the department.

12. ANALYTICAL CHEMISTRY

Open to graduate students; other arrangements may be ascertained upon application to the department.

FOR GRADUATES

No specific courses are offered to graduate students. A thesis may be chosen from one of the following lines of work provided the student has had sufficient preparation to enable him to pursue the work satisfactorily:

General Inorganic Chemistry.
Analytical Chemistry.
Technological Chemistry.

Electro Chemistry.
Physical Chemistry.

General Organic Chemistry with the following special topics:
(a) The Alkaloids. (b) The Terpenes. (c) The Resins. Seniors
who have specialized in any of these lines of work, may choose
their undergraduate thesis from this list of topics.

COMPARATIVE PHILOLOGY

This department, besides offering courses in the general principles of linguistic science, affords an opportunity for elementary studies in comparative Indo-European philology, and more particularly the investigation of Old Germanic dialects. Related courses in English philology will be found under English language and literature.

FOR UNDERGRADUATES AND GRADUATES.

5. INTRODUCTION TO TEUTONIC PHILOLOGY PROFESSOR KLAEBER
One credit (one hour per week) Second semester
Open to sophomores, juniors, and seniors, who have a fair knowledge of German; alternates with course 4.
History of Germanic philology, biographies of leading scholars (J. Grimm and others). Classification of the Germanic languages. Rapid survey of the various branches of the Teutonic group (Gothic, Norse, English, Frisian, Dutch, Low German, High German).

6. COMPARATIVE PHONOLOGY OF ENGLISH AND GERMAN PROFESSOR KLAEBER
Three credits (three hours per week) Second semester
Open to sophomores, juniors, and seniors who have a fair knowledge of German.
Elements of phonetics; history of English and German sounds; orthography. The lectures will be supplemented by practical exercises.

FOR GRADUATES

7. COMPARATIVE GRAMMAR OF THE GREEK, LATIN, AND GERMANIC LANGUAGES PROFESSOR KLAEBER
Open to graduate students who have taken an undergraduate major in a linguistic subject; other arrangements may be ascertained upon application to the department.
A general survey of the field of Indo-Germanic philology will be included.

8. GOTHIC PROFESSOR KLAEBER
Open to graduate students who have taken an undergraduate major in a linguistic subject; other arrangements may be ascertained upon application to the department.
The relation of Gothic to other Germanic dialects will be particularly emphasized. Study of the grammar (Braune, J. Wright, Streitberg) and reading of the gospels (Heyne's *Ulfilas*, 10th edition).

9. URGERMANISCHE GRAMMATIK PROFESSOR KLAEBER
Open to graduate students who have completed course 8; other arrangements may be ascertained upon application to the department.
Lectures and study of standard works (Brugmann, Kluge, Noreen, Streitberg, etc.).

10. OLD SAXON PROFESSOR KLAEBER
Open to graduate students who have taken an undergraduate major in a linguistic subject; other arrangements may be ascertained upon application to the department.
Old Saxon Grammar and interpretation of the *Heiland*.

11. OLD HIGH GERMAN PROFESSOR KLAEBER
Open to graduates who have taken an undergraduate major in a linguistic subject; other arrangements may be ascertained upon application to the department.
Braune's *Althochdeutsche Grammatik*; Braune's *Althochdeutsches Lesebuch*.
This course is identical with German 14.

ECONOMICS**FOR GRADUATES AND UNDERGRADUATES**

4. **ADVANCED ECONOMICS** PROFESSOR ROBINSON
Three credits (three hours per week) Second semester
Open to those who have completed course 1; required for a major in economics.
An advanced course in general economics, devoted largely to a study of recent theories of distribution.
Assigned readings, reports, and discussions.

5. **MONEY AND BANKING** DR. PHELAN
Three credits (three hours per week) Repeated each semester
Open to those who have completed course 1.
The history and theory of money; nature and uses of credit; functions of banks, trust companies, and other financial institutions; foreign exchange and the settlement of international balances. Lectures, text-book, assigned readings, and discussions.

28. **FINANCIAL HISTORY OF THE UNITED STATES** DR. PHELAN
Three credits (three hours per week) Second semester
Open to those who have completed courses 1 and 5.
The main lines of our financial development, including our monetary and banking history, are traced by means of lectures. Readings in the literature of the subject and topics for investigation are assigned. Lectures, text-book, assigned readings, topics, and discussions.

6. **PUBLIC FINANCE** PROFESSOR ROBINSON
Three credits (three hours per week) First semester
Open to those who have completed course 1.
The development of the state as an economic organism. Public expenditures from the view point of public wants. Budget systems of the leading countries with special emphasis on the United States. Public revenues from public domains and industries. Principles, incidents, and administration of taxation. The theory of public debts. Text-books, supplemented by lectures and assigned readings.

7. **PROBLEMS IN TAXATION** PROFESSOR ROBINSON
Three credits (three hours per week) Second semester
Open to those who have completed course 6.
Study of tax systems, tax reforms, and special forms of taxation, such as the mortgage, corporation, and inheritance taxes. Based on Seligman, *Essays in Taxation*, and reports of state tax commissions with lectures and reports on special topics.

8. **ECONOMICS OF TRANSPORTATION AND COMMUNICATION** PROFESSOR ROBINSON
Three credits (three hours per week) Second semester
Open to those who have completed course 1 and to students in the technical colleges.
A general course on the history and theory of transportation and communication with special reference to the United States; early routes and methods of migration and commerce; causes determining the location of railways; effect of steam and electricity in the consolidation of industries and of nations; signal systems, the post, telegraph and telephone; parcels post and express service; economic functions and relations of highways, interurban electric lines, steam railways, inland waterways, and ocean transportation; the organization of ocean commerce. Lectures, assigned readings, and discussions.

9. **RAILWAY ECONOMICS** PROFESSOR ROBINSON
Three credits (three hours per week) First semester
Open to those who have completed courses 1 and 8, and to students in the technical colleges.
An advanced course devoted to the study of railway problems and administration, including: (1) conditions affecting economy of operation; (2) passenger and goods traffic; (3) economic principles underlying the making of railway rates; (4) competition in relation to rate wars, discrimination between persons, places, and commodities, pooling, and various forms of combination; (5) the great railway systems of the United States; (6)

regulation by the states and the federal government; (7) government ownership and operation of railways in Europe and Australasia. Lectures, assigned readings, and special topics.

11. THE MODERN BUSINESS CORPORATION PROFESSOR GRAY
 Three credits (three hours per week) First semester
 Open to those who have completed course 1.
 The organizing, financing, and managing of corporations; the position of the corporation before the law; methods of accounting; the relation of the government to the corporation; the question of trusts in its various phases. Text-books: *Ripley, Trusts, Pools, and Corporations*, Meade's *Trust Finance*, Wyman's *Cases*. Lectures, class discussions, and reports.

10. MUNICIPAL INDUSTRIES PROFESSOR GRAY
 Three credits (three hours per week) Second semester
 Open to those who have completed course 1; if possible, should be preceded by course 11.
 The causes and the social and economic effects of the recent rapid development of municipal industries. A comparison of the results of public and of private ownership of such industries. The general question of municipal ownership. Text-books, lectures, and quizzes.

12. ECONOMICS OF COMMERCE PROFESSOR ROBINSON
 Three credits (three hours per week) First semester
 Open to those who have completed course 1, 2, or 3.
 Causes and characteristics of commercial crises; theory and mechanism of international commerce; free trade, reciprocity and protection; the balance of trade; economic causes of the contest for foreign markets; organization of the export trade, commercial treaties and foreign politics, the consular and diplomatic service as a factor in commerce. Lectures, assigned readings, and reports on special topics.

13. ECONOMICS OF COLONIZATION PROFESSOR ROBINSON
 Three credits (three hours per week) Second semester
 Open to those who have completed course 1, 2, or 3.
 The economic causes of human migration; historical survey of colonization and classification of colonies with reference to their economic bases; existing colonial systems, with special attention to the outlying possessions of the United States; colonial commerce in relation to modern commercial and foreign policies; preferential tariffs and imperial federation. Lectures, assigned readings, and reports on special topics.

26. SOCIAL THEORIES DR. PHELAN
 Three credits (three hours per week) First semester
 Open to those who have completed course 1.
 A survey of social Utopias from Plato to Henry George; with special attention to modern scientific socialism as a philosophy of industrial evolution and as a program of economic reform. Lectures, assigned readings, reports, and discussions.

27. THE STATE IN RELATION TO INDUSTRY PROFESSOR ROBINSON
 Three credits (three hours per week) Second semester
 Open to those who have completed courses 1 and 26.
 A study of the influence exercised by society and by the state on the production and distribution of wealth. The force of custom; effect of private property and other social institutions; the results of economic legislation designed to limit the freedom, or to raise the plane of competition. General survey of the relation of the state to industry. Lectures, assigned readings, and reports.

16. LABOR PROBLEMS: Part I DR. PHELAN
 Three credits (three hours per week) First semester
 Open to those who have completed course 1.
 Labor unions, strikes, systems of wage payment, arbitration, poverty, child labor, etc. Efforts, public and private, to secure justice and social well-being. Lectures, text-book, assigned readings, and discussions.

17. LABOR PROBLEMS: Part II DR. PHELAN
 Three credits (three hours per week) Second semester
 Open to those who have completed course 1, but should also be preceded by course 16.
 A study of races and immigrants in America, with reference to their economic and social contributions; the economic and social conditions in

foreign countries that lead to emigration; the general problem of immigration; the special problems of the Slav, the Italian, the negro, the Chinese and the Japanese. Lectures, text-book, topics, and discussions.

18. CHARITIES AND CORRECTIONS WITH SPECIAL REFERENCE TO ECONOMIC CONDITIONS IN AMERICAN CITIES MR. LIES
 Three credits (three hours per week) First or second semester
 Open to those who have completed course 1, course 3, or sociology 1; required in the six-year medical course.

A study of the causes of economic dependence in American cities, the standard of living, and the constructive agencies for economic betterment. Given by lectures with assigned readings and visits of inspection in the Twin Cities.

19. THE PRINCIPLES OF ACCOUNTING ASSISTANT PROFESSOR ROSTALL
 Six credits (three hours per week) Both semesters
 Open to those who have completed course 1.

The theory and practice of accounting, with a view to general business efficiency. Methods employed in manufacturing, mercantile, banking, and railway accounting. Analysis of industrial, bank, and railway reports. Lectures and exercises.

20. ELEMENTS OF BUSINESS LAW DR. PHELAN
 Three credits (three hours per week) Second semester
 Open to those who have completed course 1.

The principles of law governing ordinary commercial transactions. The aim is to teach so much of the law as every educated man ought to know for his guidance in everyday business affairs. Assigned readings, lectures and quizzes.

22. BUSINESS ORGANIZATION ASSISTANT PROFESSOR ROSTALL
 Three credits (three hours per week) Second semester
 Open to those who have completed course 1.

A study of the internal organization and management of large-scale industry, covering typical manufacturing and mercantile concerns.

Based on Sparling's *Introduction to Business Organization*, with lectures, assigned readings, and discussions.

23. ECONOMICS OF FORESTRY AND IRRIGATION MR. COULTER
 Three credits (three hours per week) First semester
 Open to those who have completed course 1 or course 2.

Preliminary survey of forest controls and forest influences. In this connection, special attention to the progress of the national irrigation works in relation to economic development, land laws, and land tenure. Location and value of the extant forest resources of the United States. Intensive study of the forest industry, covering: (1) history and processes, (2) employees, (3) division into stages (logging, sawing, etc.), (4) internal organization of each, (5) transportation and marketing, (6) economic relations to other industries, (8) share of forest products in foreign commerce, (9) economic necessity of a scientific system of forestry. Lectures, assigned reading, and reports.

14. ECONOMICS OF AGRICULTURE MR. COULTER
 Three credits (three hours per week) Second semester
 Open to those who have completed course 1 or course 2, and to others by special permission of the instructor.

Preliminary survey and classification of industries as extractive, manufacturing, and distributive; and comparison of the several extractive industries in the United States, viz. fishing, forestry, grazing, farming, and mining. Historic development of agriculture and comparison of existing systems, with reference to stage of economic development and geographic conditions. Transition in the United States from extensive to intensive, and from general to specialized farming in relation to the law of decreasing returns. Markets, transportation facilities, and other causes affecting the value of land and the prices of farm products. The size, organization, labor-system, and ownership of farms as bearing on economic efficiency and social and political conditions. Lectures, assigned readings, reports on special topics, and quiz.

15. ECONOMICS OF INSURANCE ASSISTANT PROFESSOR ROSTALL
 Three credits (three hours per week) First semester
 Open to those who have completed course 1 and to others by special permission of the department.

FUNCTIONS OF INSURANCE: life, fire, marine, accident, fidelity; history and theory of life insurance, forms of standard policies, public supervision. The aim is to treat those aspects of insurance which are of importance to practical men of affairs.

25. ECONOMICS OF INVESTMENT AND SPECULATION ASSISTANT PROFESSOR ROSTALL
 Three credits (three hours per week) First semester
 Open to juniors and seniors who have completed course 5.

The causes affecting the values of securities; classes of investments and methods of calculating income; bearings of investment on the formation of social classes; the economic functions of speculation; organization and working of stock and produce exchanges; their relation to industry and to the money market; the work of Wall Street. Lectures, assigned readings, and exercises in the interpretation of current quotations for securities.

FOR GRADUATES

29. THEORY AND PRACTICE OF STATISTICS ASSISTANT PROFESSOR ROSTALL
 Two credits (two hours per week) First semester
 Open to those who have completed six credits in economics.

An introduction to the theory and method of statistics; aspects of economic and social life which are capable of statistical measurement; use and limitations of index numbers; theory of prices and price levels; based on the works of Bowley and Mayo-Smith, with lectures and practical exercises.

30. HISTORY OF ECONOMIC THOUGHT PROFESSOR ROBINSON
 Two credits (two hours per week) First semester
 Open to those who have completed six credits in economics.

A survey of economic thought, especially since Adam Smith. Emphasis is placed on the most recent period. Lectures, assigned readings, and reports on special topics.

24. SCOPE AND METHODS OF ECONOMICS PROFESSOR ROBINSON
 Two credits (two hours per week) Second semester
 Open to those who have completed six credits in economics.

Consideration of the successive views which have prevailed as to the scope and logical method of economics; relation of economics to the other social sciences and to ethics. Lectures, assigned readings, and discussions.

21. SEMINAR IN ECONOMICS PROFESSORS GRAY AND ROBINSON,
 MR. GEROULD, ASSISTANT PROFESSOR ROSTALL,
 DR. PHELAN AND MR. COULTER

Six credits (three hours per week) Both semesters

Open to graduate students and to seniors who have completed at least twelve credits in economics and are capable of making original investigations; both semesters must be completed before credit is given for the first semester.

A course in research and in methods of investigation. The course will be conducted jointly by all the instructors, each striving to be of special service to students who choose topics within the field of his special interests: Professor Gray in connection with local public service corporations; Professor Robinson in connection with taxation, transportation, and industries of importance in this section, such as wheat and iron; Dr. Phelan in connection with currency questions, labor, socio-economic theories, and taxation.

ECONOMIC ENTOMOLOGY

FOR GRADUATES

SPECIAL PROBLEMS IN ECONOMIC ENTOMOLOGY PROFESSOR WASHBURN
 EDUCATION

FOR UNDERGRADUATES AND GRADUATES

Preliminary Requirements: Students who desire to undertake graduate work in education must have a general knowledge of psychology and of the

history of education, and some acquaintance with the theory of education. For a minor in education the candidate may pursue studies either in the theory and practice of elementary teaching, the organization and methods of secondary education, or in advanced educational theory and administration. Students who undertake a major in education are expected to do work in at least two of these fields. Selection will be made by the candidate on the approval of the head of the department from the following courses:

4. SECONDARY EDUCATION

Three credits (three hours per week)

Open to seniors who have completed courses 1 and 2.

A study of secondary education in the United States, with such references to the secondary schools of other countries as will lead to a clearer understanding of the place and function of the high school, its curriculum, the problems of present-day importance, and the relation of the high school to other parts of the system of public instruction. The course will be conducted by lectures, reports, and discussions.

5. PRINCIPLES AND ORGANIZATION OF ELEMENTARY TEACHING

PROFESSOR RANKIN

Three credits (three hours per week)

First semester

Open to seniors who have completed courses 1 and 2 and philosophy 1.

This course includes a consideration of the course of study of the elementary school and of the best methods of instruction. It is conducted by means of lectures, assigned readings, discussions and reports. It is planned for all students who expect to teach in the high school or to be principals or superintendents. No credit is given in this course to graduates of normal schools who have received one year's credit at the University.

6. PRINCIPLES AND ORGANIZATION OF SECONDARY TEACHING

PROFESSOR RANKIN

Three credits (three hours per week)

Second semester

Open to seniors who have completed courses 1 and 2, and who have completed course 4 or are pursuing course 10.

This course includes lectures on the general methods of secondary teaching, assigned readings, reports, and discussions. It is planned more particularly for those who expect to teach in high schools.

8. SCHOOL ADMINISTRATION

PROFESSOR RANKIN

Three credits (three hours per week)

First semester

Open to seniors who have completed courses 1 and 2.

An introductory study of school administration, conducted by lectures, reports, and discussions; the organization of school systems, the work of school boards, superintendents, principals, and teachers. This course is planned for students without any teaching experience, who hope later to do work in supervision.

9. SCHOOL SUPERVISION

PROFESSOR RANKIN

Three credits (three hours per week)

Second semester

Open to seniors; intended only for students with experience in teaching; credit will not be given both for course 8 and for course 9.

An advanced course treating of the duties of principals and superintendents.

10. COMPARATIVE STUDY OF SCHOOL SYSTEMS

PROFESSOR JAMES

Three credits (three hours per week)

Second semester

Open to seniors who have completed courses 1 and 2.

This course deals with the school systems of Germany, France, England, and the United States, with special reference to principles and methods of administration. Elementary, secondary, and higher institutions are examined with emphasis varying in successive years. The course is conducted partly by lectures and partly by assigned readings, reports, and discussions.

FOR GRADUATES**11. MODERN EDUCATIONAL THEORIES**

PROFESSOR JAMES

Three credits (three hours per week)

Second semester

Open to seniors who have completed courses 1 and 2, and philosophy 1.

An advanced course in educational theory, dealing particularly with the contributions of Rousseau, Froebel, and Herbart, special emphasis being laid upon one of these writers in each successive year.

12. CURRENT PROBLEMS IN ELEMENTARY TEACHING PROFESSOR RANKIN
 Two credits (two hours per week) First semester
 Open to seniors and graduate students who have completed course 5.
 This is a seminar course, involving a general discussion of some current problems in elementary education, one or two of which are worked out practically by the student under the direction of the instructor through readings, the visiting of schools, and through class discussions.

13. EDUCATIONAL CLASSICS PROFESSOR JAMES
 Two credits (two hours per week) First semester
 Open to seniors who have completed courses 1 and 2, and to graduate students.
 A seminar course for the reading of selected educational classics and for the detailed study of corresponding periods in educational history.

14. CURRENT PROBLEMS IN SECONDARY TEACHING PROFESSOR RANKIN
 Two credits (two hours per week) Second semester
 Open to seniors and graduate students who have completed course 6.
 This is a seminar course for advanced students, preferably with teaching experience, or who wish to pursue a theoretical and a practical study of some current problems in connection with secondary teaching. The course will be conducted by lectures, class discussions, readings, and by the visiting of schools.

15. PROBLEMS IN SCHOOL ADMINISTRATION PROFESSOR JAMES
 Two credits (two hours per week) Second semester
 Open to seniors and graduate students who have completed courses 1 and 2.
 A research course for advanced students, preferably with teaching experience, who desire to take up the investigation of some question of educational administration. The course will be conducted by lectures, class discussions, assigned readings, and, when possible, by a study of actual school conditions falling within the proposed field.

16. SCHOOL SANITATION PROFESSOR RANKIN
 Two credits (two hours per week) First semester
 Open to seniors and graduate students.
 This course will be conducted by text, by lectures, and by investigations into problems of school lighting, heating, ventilation, and other questions of school architecture and management connected with the physical well-being of the pupils.

17. ORGANIZATION OF HIGHER EDUCATION PROFESSOR JAMES
 One credit (one hour per week) Second semester
 Open to seniors and graduate students who have completed courses 1 and 2.
 This course is intended for students who are interested in the general problems of educational administration and who look forward later to college teaching. It includes an historical sketch of the development of the American university, with discussions of modes of organization and administration problems of departmental teaching, and questions of class instruction.

ELECTRICAL ENGINEERING

The courses offered by the department of electrical engineering are open to graduate students having the required preliminary training. Thorough courses in physics and mathematics are essential prerequisites. The laboratory, shop and library of the department provide facilities for a moderate amount of research work in addition to the regular courses of study.

The laboratory equipment includes about forty dynamo electric machines of various types and sizes for direct and alternating currents, such as constant current and constant potential direct current generators and motors, single phase and polyphase alternators, commuting, induction and synchronous motors and rotary converters, each furnished with suitable regulating devices. A number of these machines have been equipped with special devices for experimental purposes. Lamps, rheostats, batteries, fans and brakes afford convenient and ample means for taking up the energy of dynamos and motors. To facilitate testing, there are a number of pairs of similar machines. A three-ton traveling crane facilitates handling the machines. Power is ob-

tained from a main shaft driven by the engines of the lighting plant, or by motors connected with the University power circuits, with a storage battery or with the circuits of The Minneapolis General Electric Company, which supplies direct current at 500 volts and alternating current at 2,250 volts. The laboratory has equipment for obtaining low voltage direct or alternating current up to 2,000 amperes, for continuous EMF to up to 2,000 volts and for alternating EMF up to 40,000 volts. An excellent assortment of instruments of well-known American and foreign makers is available for laboratory use. A well equipped standardizing laboratory furnished with certain standards of current electromotive force and resistance, allows the frequent checking of instruments, so that students may work to any desired degree of refinement. The meter and lamp testing laboratories are furnished with a wide variety of arc and incandescent lamps and meters with all necessary standards and other accessories. The electro-chemical laboratory provides facilities for the construction and testing of various cells, for electro-plating and other electrolytic processes and for the formation and study of electric furnace products. Alternators, rotary converters, transformers, lamps, motors, condensers, special apparatus and suitable instruments afford facilities for the experimental study of alternating currents. Telephone transmitters, receivers and accessories provide for practice in assembling and testing the ordinary telephonic apparatus and circuits and for investigation.

The department library contains an excellent collection of electrical and allied works, including a full set of United States Patent Office Gazettes. New books and trade publications are being added continually. Files of twenty-two journals are nearly complete and others are being collected and bound. These, with the files in the general and other departmental libraries of the University, offer excellent facilities for research work. The reading room receives regularly the leading American and foreign periodicals devoted to electrical engineering and allied interests.

FOR UNDERGRADUATES AND GRADUATES

1. **APPLIED ELECTRICITY** PROFESSOR SHEPARDSON
Three credits (three hours per week) Second semester
Required of juniors E. E. course.
Preparation, course 5 P.
Outline of industrial uses of electricity; applications of Ohm's law; methods and calculation of wiring.
2. **ELECTRICAL MACHINERY** PROFESSOR SPRINGER
Three credits (six hours per week) First and second semesters
Preparation, courses E. E. 1, P. 5, 6, and M. 5, 6.
Electrical engineering measuring instruments and their use; units; theory of dynamo electric machinery; methods of regulation, construction and operation of generators and motors; methods of testing.
6. **ALTERNATING CURRENTS** PROFESSOR SHEPARDSON
Two or three credits (two or three hours per week) First and second semesters
Post senior year. Preparation: courses 1, 2.
Phenomena, measurement and use of alternating currents; theory of line, transformer, generator and motor; types of apparatus.
Text-book: Steinmetz, Alternating Current Phenomena.
7. **ELECTRICAL ENGINEERING PRACTICE. Batteries** MR. RYAN
One credit (one hour per week) First semester
Post senior year. Preparation: course 2.
General theory of primary and secondary cells; types and methods of construction; commercial applications; operation of battery plants; construction and test of cells by students; test of a commercial plant. Text-book: Lyndon, Storage Battery Engineering.
8. **ELECTRICAL ENGINEERING PRACTICE. Lighting** PROFESSOR SHEPARDSON
One credit (one hour per week) First semester
Post senior year. Preparation: course 2.
Comparison of different sources of light; photometry; physics of the arc; history, design and regulation of arc lamps; adaptation to constant current, constant potential and A. C. circuits; carbons; history, manufacture and economy of incandescent lamps; distribution of light.

9. ELECTRICAL ENGINEERING PRACTICE. Central stations MR. RYAN
 Two credits (two hours per week) First or second semester
 Post senior year. Preparation: courses 2 and 6 E. E.
 Preliminary surveys; choice of electrical systems; load diagrams;
 best units of power; comparison of steam, gas and water
 power; location, design and erection of station buildings; boil-
 ers, engines, dynamos, storage batteries, switch board and
 lines; operation and regulation; maintainance of plant; emer-
 gencies; examination of stations in Minneapolis and St. Paul.

10. ELECTRICAL ENGINEERING PRACTICE. Railways PROFESSOR SPRINGER
 One credit (one hour per week) Second semester
 Post senior year. Preparation: E. E. 2 or E. E. 4.
 History and development; different systems of distribution; loca-
 tion and calculation of feeders; line and track construction;
 choice of motors, trucks, generators and engines; operation
 and repairs. Text-book: Gotshall, Electric Railway Economics.

11. ELECTRICAL ENGINEERING PRACTICE. Transmission PROFESSOR SHEPARDSON
 One credit (one hour per week) Second semester
 Post senior year. Preparation: courses 1, 2 and 5 E. E.
 Utilization of natural forces; various methods of transmission;
 theory of electric motor; power distribution with constant
 current, constant potential and alternating systems; design of
 line; study of particular plants.

12. ELECTRICAL ENGINEERING PRACTICE. Telegraph and telephone PROFESSOR SHEPARDSON
 One or two credits (one or two hours per week) Second semester
 Post senior year. Preparation: E. E. 1 and E. E. 5.
 Various systems and instruments used in local and long distance
 telegraphy and telephony; design and construction of switch-
 boards and lines; protection from inductive and other dis-
 turances; police, fire alarm and district messenger systems.

13. ELECTROCHEMISTRY PROFESSOR SHEPARDSON
 One or two credits (one or two hours per week) First or second
 semester
 Post senior year.
 Theoretical and experimental study of electrolytic and electro-
 thermal processes.

14. ELECTRICAL DESIGN MR. RYAN
 Three credits (six hours per week) First semester
 Post senior year. Preparation: courses 1 and 2 P., courses E.
 E. 1, 2 and M. E. 13.
 Problems in designing circuits, electro-magnets and dynamos;
 complete working drawings and specifications to accompany
 each design.

15. ELECTRICAL DESIGN MR. RYAN
 Three credits (six hours per week) Second semester
 Post senior year. Preparation: courses 6 and 14 E. E.
 Design of a transformer, switchboard and other problem.

16. ELECTRICAL DESIGN MR. RYAN
 Two credits (four hours per week) Second semester
 Post senior year. Preparation: courses 8 and 14 E. E.
 Designs, specifications and estimates for an electric light or pow-
 er plant.

17. ELECTRICAL LABORATORY PROFESSOR SPRINGER
 Three credits (six hours per week) First and second semesters
 Senior year. Preparation: courses P. 5, 6 and 1 and 2 E. E.
 Tracing circuits and locating faults; electrical engineering
 measurements; calibration of instruments; operation and char-
 acteristic curves of generators and motors.

18. ELECTRICAL LABORATORY PROFESSOR SPRINGER
 Three credits (six hours per week) First and second semesters
 Post senior year.
 Experimental study of alternating currents; regulation and effi-
 ciency tests of alternators, transformers, motors and rotaries;
 photometric tests of incandescent and arc lamps.

19. ELECTRICAL LABORATORY PROFESSOR SHEPARDSON, PROFESSOR SPRINGER
One or two credits (two or four hours per week) First or second semester
Post senior year. Efficiency tests and special problems

20. ELECTRICAL ENGINEERING MEASUREMENTS PROFESSOR SPRINGER
Application of measurements to electrical engineering practice.
Lectures and laboratory.

21. PLANT OPERATION MR. RYAN, MR. DIXON
One credit (equivalent to two hours per week) First or second semester
Practice in operation and care of boilers, engines, motors, dynamos, battery and circuits of the University lighting plant.

22. JOURNAL READING (Post senior I and II (1) PROFESSOR SHEPARDSON
One credit First and second semesters
Post senior year.
Weekly discussion of current electrical periodicals. The class meets monthly with the Minnesota Section of the American Institute of Electrical Engineers.

23. PRECISE ELECTRICAL ENGINEERING MEASUREMENTS PROFESSOR SPRINGER
Preparation: course 19.
Lectures and laboratory work. Precise measurements of resistance, voltage, current, self-induction and capacity; standardization of measuring instruments. Open to a limited number subject to approval.

24. ILLUMINATING ENGINEERING PROFESSOR SHEPARDSON
Lectures and laboratory work. Investigation of performance of electric and gas lamps, reflectors and diffusers; luminous efficiency, distribution, color characteristics, physiological phenomena, methods of determining location, kind and quantity of lights for obtaining desired illumination.

25. TELEPHONE ENGINEERING PROFESSOR SHEPARDSON, PROFESSOR EDDY
Lectures and laboratory work. Theoretical and experimental study of telephonic apparatus; lines and line phenomena, including induction, transportations, loading coils, etc.

26. ALTERNATING CURRENT PHENOMENA PROFESSOR SHEPARDSON
Lectures and laboratory work. Study of wave forms, transient phenomena; oscillographic investigations; tests of apparatus.

ENGLISH LANGUAGE AND LITERATURE

FOR GRADUATES AND UNDERGRADUATES

3. EARLY ENGLISH PROFESSOR KLAEBER, ASSISTANT PROFESSOR BEACH
Six credits (three hours per week) Both semesters
Open to sophomores, juniors and seniors; required of all who take a major or obtain a teacher's certificate.
A study of the language and reading of representative selections of old English prose and poetry. The relation to the modern English will be particularly emphasized.

4. INTRODUCTION TO MIDDLE ENGLISH LANGUAGE AND LITERATURE PROFESSOR KLAEBER
Two credits (two hours per week) First semester
Open to sophomores, juniors, and seniors, who have taken the first semester of course 3; alternates with course 5.
An outline of middle English grammar including the interpretation of selected texts.

5. PIERS THE PLOWMAN PROFESSOR KLAEBER
Two credits (two hours per week) First semester
Open to sophomores, juniors and seniors, who have taken the first semester of course 3; alternates with course 4; not given in 1908-9.
A critical study of *Piers the Plowman*.

13. THE BIBLE AS LITERATURE ASSISTANT PROFESSOR POTTER
 Three credits (three hours per week) Second semester
 Open to juniors and seniors.

A literary study of the Old Testament with special attention to forms and the critical study of selected readings.

16. CONSTRUCTION AND DEVELOPMENT OF THE MODERN DRAMA ASSISTANT PROFESSOR PECK
 Six credits (three hours per week) Both semesters
 Open to seniors who have completed two years of work in English, which must include course 15.
 First semester: a study of the theory of the drama, with the history of English drama to the middle of the nineteenth century. Second semester: a study of the inter-relation of the English with the continental drama in the late nineteenth century with special emphasis upon Ibsen.

19. HISTORY OF LITERARY CRITICISM PROFESSOR BURTON
 Two credits (one hour per week) Both semesters
 Open to juniors and seniors; both semesters must be completed before credit is given for the first semester.
 This course traces the rise, growth and present condition of the principles of criticism as applied to literature.

23. SENIOR SEMINAR IN ENGLISH ASSISTANT PROFESSOR PECK
 Two credits (one hour per week) Both semesters
 Open to seniors who have taken courses 3 and 4 or any of the following courses: 6, 19, 20, 22.
 Hakluyt's *Voyages* will be studied in 1908-9. The work will consist of an inquiry into the vivid and dramatic sources of the language and literature found in this "prose epic" of the Elizabethan seamen.

FOR GRADUATES

24. ANGLO-SAXON PROFESSOR KLAEBER
 First semester
 Open to graduates who have taken an undergraduate major in English; other arrangements may be ascertained upon application to the department.

25. BEOWULF PROFESSOR KLAEBER
 Second semester
 Open to graduate students who have taken an undergraduate major in English; other arrangements may be ascertained upon application to the department.

26. PRINCIPLES OF CRITICISM MR. FIRKINS
 Open to graduate students who have taken an undergraduate major in English; other arrangements may be ascertained upon application to the department.
 This course comprises a brief treatment of the elements or forces in literature, e. g., clearness, vigor, beauty, precision, art, taste, humor, truth, ethics, and the like; an exposition of literary types, e. g., lyric, epic, drama, short story, novel, biography, etc., in relation to the standards and methods of judging each.

27. SHAKESPERE ASSISTANT PROFESSOR POTTER
 Open to graduate students who have taken an undergraduate major in English; other arrangements may be ascertained upon application to the department.

28. THE DRAMA AS A LITERARY FORM PROFESSOR BURTON
 Both semesters
 Open to graduate students who have taken an undergraduate major in English; other arrangements may be ascertained upon application to the department.

29. THE DRAMA AS A LITERARY FORM PROFESSOR BURTON
 Both semesters
 Open to graduate students who have taken an undergraduate major in English; other arrangements may be ascertained upon application to the department.

FORESTRY

Equipment: The vast lumbering operations in the northern part of Minnesota offer the best of opportunities for a study of that branch of forestry. The establishment of the Chippewa Forest Reserve and its management by the Forest Service gives opportunities which few other sections possess to study the best methods of forest management. The state has twenty-one thousand acres of timber land to be used as a forest and game preserve, on which student help will be largely used. In addition Itasca state park, consisting of 22,000 acres, is used by the Forestry School as a demonstration forest and experiment station. Every student spends about twelve months in the park during his course and does practical work in all branches. The use of this park gives the Minnesota Forestry School a forest equipment which is unsurpassed anywhere.

Graduate work is offered to those who have sufficient preparation to pursue it to advantage. Two courses are offered but others may be given if conditions seem to make it desirable.

1. FOREST MANAGEMENT AND ECONOMICS	PROFESSOR GREEN
A general course in economics as applied to the problem of properly handling forest wealth.	
2. WORKING PLANS FOR FORESTS	PROFESSOR GREEN
The study and discussion of the working plans in use in foreign countries. Criticism of working plans in the United States.	

EXPERIMENTAL ENGINEERING**FOR GRADUATES AND UNDERGRADUATES**

1. MATERIALS TESTING LABORATORY	PROFESSOR KAVANAUGH, MR. SHOOP
Two credits (lecture and laboratory) First semester	
Required of seniors. Open to those pursuing course M. 7.	
Investigation of the strength and physical qualities of iron, steel, brass, copper, wood, belting, ropes, chains and cement.	
Supplemented by lectures on the various materials of construction and standard methods of testing.	
2. STEAM LABORATORY	PROFESSOR KAVANAUGH, MR. SHOOP
Two credits (lecture and laboratory) Second semester	
Required of senior E. E. Open to those pursuing course 20 M. E.	
Valve setting, indicator practice, calibration of gages, calorimetry, efficiency of screws, hoists and other machines.	
3. HYDRAULIC LABORATORY	PROFESSOR KAVANAUGH, MR. SHOOP
Two credits (lecture and laboratory) Second semester	
Required of senior C. E. Open to those pursuing course M. 8.	
Hydraulic measurements calibration of weirs, nozzles, orifices and meters. Tests of water motors, rams, pulsometers, steam and power pumps and other hydraulic apparatus.	
6. EXPERIMENTAL LABORATORY	PROFESSOR KAVANAUGH
Three credits First semester	
Required of post senior M. E.; preparation: course 4.	
Calibration of dynamometers and measurement of power.	
Testing lubricating value of oils. Tests of injectors and ejectors. Tests of steam-turbines, steam-engines and boilers, and complete power and lighting plants.	
7. EXPERIMENTAL LABORATORY	PROFESSOR KAVANAUGH
Two credits First semester	
Required of post senior E. E. Preparation: courses, 8 mathematics and mechanics and 20 M. E.	
Hydraulic measurements. Tests of water motors, rams, steam and power pumps. Measurement of power. Tests of gas and steam engines, boilers and complete power and lighting plants.	

8. EXPERIMENTAL LABORATORY PROFESSOR KAVANAUGH
 Three credits First semester
 Elective for post seniors. Preparation: course 1. Tests of
 the properties of cements, concrete, and reinforced concrete.
 Strength of beams, columns, joints and framed structures.

9. GAS ENGINE LABORATORY PROFESSOR KAVANAUGH
 Three credits Second semester
 Required of post senior M. E. Preparation: courses 21 M.
 E. and 6 Ex. E. A continuation of course 6, also tests of
 gas, gasoline and hot-air engines, gas producers, air com-
 pressors, automobile and locomotive testing and special work.

10. EXPERIMENTAL LABORATORY PROFESSOR KAVANAUGH
 Two or four credits Second semester
 Elective for post seniors. Special research work and com-
 mercial tests.

FRENCH AND ITALIAN

FOR UNDERGRADUATES AND GRADUATES

5. THE CLASSICAL PERIOD OF FRENCH LITERATURE PROFESSOR BENTON
 Six credits (three hours per week) Both semesters
 Open to those who have completed course 2 or course 3; both
 semesters must be completed before credit is given for the first
 semester.
 The reading of works and selections produced during the classical period
 of French literature and conversations in French concerning the same. The
 works of Corneille, Racine, Molière, La Fontaine, etc. Compositions.

6. ADVANCED FRENCH CONVERSATION PROFESSOR BENTON
 Four credits (two hours per week) Both semesters
 Open to those who have completed course 2 or course 3; both
 semesters must be completed before credit is given for the first
 semester.
 Conversations on French history, literature, the drama, etc.

7. FRENCH LITERATURE OF THE NINETEENTH CENTURY PROFESSOR BENTON
 Six credits (three hours per week) Both semesters
 Open to those who have completed course 2 or course 3 and course
 5; both semesters must be completed before credit is given for
 the first semester.
 Lectures in French on the history of modern literature. Select works of
 some of the authors read and discussed. Compositions and essays.

8. TEACHERS' COURSE IN FRENCH PROFESSOR BENTON
 Two credits (one hour per week) Both semesters
 Open to those who have completed course five; both semesters must
 be completed before credit is given for the first semester.
 Special practice in pronunciation. Discussion in French of methods of
 teaching the French language and literature.

9. ROMANCE PHILOLOGY PROFESSOR BENTON
 Two credits (one hour per week) Both semesters
 Open to those who have completed course 5; both semesters must
 be completed before credit is given for the first semester.
 Lectures on the phonetical development of the French and other Romance
 languages from popular Latin. Reading of old French texts.

10. ITALIAN LITERATURE PROFESSOR BENTON
 Two credits (one hour per week) Both semesters
 Open to those who have completed course 5; both semesters must
 be completed before credit is given for the first semester.
 Edgren's *Italian Grammar*, Dante's *Divine Comedy*.

14. ROMANCE LANGUAGES: OLD FRENCH PROFESSOR BENTON
 Both semesters
 Open to graduate students; other arrangements may be ascer-
 tained upon application to the department.
 Comparative phonetics and grammar of French and other romance
 languages. Some of the oldest monuments of the French language are studied

and the phonetic changes compared with modern French and English. Special attention is given to the period when French words came into the English language.

15. **HISTORY OF FRENCH LITERATURE** PROFESSOR BENTON
Two credits (one hour per week) Both semesters
Open to graduate students; both semesters must be completed before credit is given for the first semester.
A discussion of the evolution of the various schools and doctrines in French literature.

16. **ITALIAN LITERATURE** PROFESSOR BENTON
Two credits (one hour per week) Both semesters
Open only to graduate students who have completed course 5; both semesters must be completed before credit is given for the first semester.
History of Italian Literature, special: *The Divine Comedy*.

GEOLOGY

FOR UNDERGRADUATES AND GRADUATES

3. **INDUSTRIAL GEOGRAPHY** ASSISTANT PROFESSOR LEHNERTS
Three credits (three hours per week) Second semester
Open to juniors and seniors who have completed course 1 or 2.
The structural features of the North American continent outlined as an introduction. Following this is a study of the types of soil and dominating climatic characters of the several agricultural regions of the continent, a discussion of the geography of industries as they have grown up within the past 100 years and their dependence upon physiographic conditions; a study of local industries effected through excursions and reports. A brief survey of industries in other parts of the world parallels the more detailed study of North America. Throughout the course cause and effect are kept in view.

8. **PALEONTOLOGY** ASSISTANT PROFESSOR SARDESON
Six credits (three hours per week) Both semesters
Open to juniors and seniors who have taken or are taking courses in geology or biology.
The chief types of organisms as represented by fossils will be studied successively. The leading fossils and their phylogenetic history will be treated with considerable detail. Lectures and demonstrations.

9. **PALEONTOLOGIC PRACTICE** ASSISTANT PROFESSOR SARDESON
Six credits (three hours per week) Both semesters
Open to juniors and seniors who have completed course 8; may be taken by students pursuing courses in geology and biology in conjunction with course 7.
The collection, preparation, and study of materials, examination of collections, and reading will be carried on with a view to more complete knowledge of the groups of fossil organisms as presented in course 7.

11. **PETROGRAPHY** MR. GROUT
Three credits (three hours per week) Second semester
Open to juniors and seniors who have completed course 10.
The identification of rocks through the optical study of the component minerals; rock structures as seen under the microscope; alterations of rocks, and stratigraphic relations are studied. Preparation of material for study, its collection in the field, and an examination of some group of Minnesota crystalline rocks are features of the course. Laboratory, lectures, reference reading, and field work.

13. **ORE DEPOSITS** PROFESSOR HALL
Three credits (three hours per week) First semester
Open to seniors who have completed geology 1 and mineralogy 1.
History of mineral discovery and development in the Americas; a discussion of the origin and distribution of ore deposits, embracing the chemical processes involved in their formation and subsequent alterations; a description of the geology and mineralogy of ore bodies, particularly those yielding gold, silver, copper, iron, lead, and zinc.

14. SPECIAL PROBLEMS

Two credits (two hours per week)

Open to seniors who have completed course 1 or 13.

PROFESSOR HALL
Second semester

The investigation by individual students of particular problems, involving the field work of an investigation of some particular formation and the laboratory investigation and reading incident to the study of the material collected. The methods of systematically recording and interpreting geological and mineralogical data as observed in the field, the keeping of note-books, and the preparation of geological maps, profiles, and sections will be taught.

FOR GRADUATES

18. PETROGRAPHICAL PROBLEMS

PROFESSOR HALL AND MR. GROUT
Both semesters

Open to graduate students; other arrangements may be ascertained upon application to the department.

A study of rocks as geological bodies; the genesis of rocks and their chemical and dynamical alterations, illustrated in the gneisses and gabbro schists of the Minnesota river valley or the granites and basic eruptives of central Minnesota.

19. THE KEWEENAWAN ERUPTIVES

PROFESSOR HALL AND MR. GROUT
Both semesters

Open to graduate students; other arrangements may be ascertained upon application to the department.

This course treats first, eastern and northwestern Minnesota, their stratigraphic relations, textural and structural characters; second, other problem in the Keweenawan to be selected on consultation.

20. GLACIAL GEOLOGY

PROFESSOR HALL
Both semesters

Open to graduate students; other arrangements may be ascertained upon application to the department.

The local features of glacial phenomena. Field work will form the special feature of this course, embracing the formations at Minneapolis or some area accessible from it, as a survey of the glacial lakes in the vicinity, the gorge of the Falls of Saint Anthony, the Dalles of the Saint Croix, and other problems. The special field to be selected on consultation.

21. PALEONTOLOGIC GEOLOGY

ASSISTANT PROFESSOR SARDESON

Three credits (three hours per week)

Open to graduate students who have completed courses 1, 6, and 8.

A study of the Ordovician fauna with special illustrations from the Ordovician of Minnesota and neighboring states.

22. ADVANCED PALEONTOLOGY

ASSISTANT PROFESSOR SARDESON

Six credits (three hours per week)

Open to graduate students who have completed course 8.

The study of a selected group of fossils; a practical acquaintance with the forms and literature of the group is sought. The class work is to be supplemented by a thesis.

GERMAN

FOR UNDERGRADUATES AND GRADUATES

6. THE DRAMA

PROFESSOR SCHLENKER, ASSISTANT PROFESSORS

WILKIN AND JUERGENSEN, AND MR. BURKHARD

Six credits (three hours per week)

Both semesters

Open to those who have taken courses 1 and 2, or course 4; both semesters must be completed before credit is given for the first semester. This course may be supplemented by course 8.

First semester: Modern drama. Play of Hebbel, Hauptmann, or Sudermann. Study of the present-day drama in Germany. Assigned readings and reports. Second semester: Classic drama. Play of Lessing, Goethe, or Schiller. Study of dramatic structure. History of the German drama in the eighteenth century.

9. GERMAN LITERATURE OF THE CLASSIC PERIOD PROFESSOR MOORE
 Six credits (three hours per week) Both semesters
 Open to those who have completed courses 1 and 2 (by special permission) or 3 and 7, or 4 and 6; both semesters must be completed before credit is given for the first semester; required of those who obtain a teacher's recommendation in German.
 First semester: Goethe's *Faust*; its genesis; the Faust legend; its treatment in literature before and since Goethe's time; plan of Goethe's *Faust*; solution of the Faust problem in part two. Lectures and collateral reading; essays by the class. Schiller's ballads, and other representative poems of this period. German versification. Second semester: Reading and discussion of Lessing's more important critiques, the *Laocoön*, and *Dramaturgie*.

10. MODERN AUTHORS PROFESSOR MOORE
 Six credits (three hours per week) Both semesters
 Open to those who have completed courses 1, 2, and 9 (by special permission), or 4, 6, and 9, or 3, 7, and 9; both semesters must be completed before credit is given for the first semester; required of those who obtain a teacher's recommendation in German.
 First semester: Romantic school and *Junge Deutschland*. Second semester: German literature since 1848.

12. HISTORY AND LITERATURE OF THE REFORMATION PROFESSOR MOORE
 Four credits (two hours per week) Both semesters
 Open to seniors and graduates who have completed course 9 or course 10; both semesters must be completed before credit is given for the first semester.
 Brandt, Luther, Hutten, Sachs, Murner, and Fischart. Selections from Jansen and Egelhaaf.

13. MIDDLE HIGH GERMAN PROFESSOR SCHLENKER
 Four credits (two hours per week) Both semesters
 Open to seniors and graduates who have completed course 9 or course 10; both semesters must be completed before credit is given for the first semester.
 Study of the language and literature of the period. Paul's *Mittelhoch-deutsche Grammatik*. Selected readings from *Armer Heinrich*, *Nibelungen Lied*, *Gudrun*, the poems of Walter von der Vogelweide, *Parsifal*, etc.

17. HISTORY OF GERMAN LITERATURE ASSISTANT PROFESSOR JUERGENSEN
 Four credits (two hours per week) Both semesters
 Open to seniors and graduates who have completed course 9; both semesters must be completed before credit is given for the first semester.
 Lectures in German on the history of German literature. Reviews and topical research on the part of the students.

FOR GRADUATES

14. OLD HIGH GERMAN PROFESSOR KLAEBER
 Four credits (two hours per week) Both semesters
 Open to seniors who have taken course 9 or course 10; both semesters must be completed before credit is given for the first semester.
 This course is identical with comparative philology 11.

15. SEMINAR IN GERMAN DRAMA PROFESSOR SCHLENKER
 Two credits (one hour per week) Both semesters
 Open to graduates and by permission of the department to undergraduates but without credit.
 An outline of the history of German dramatic literature from its beginning to and including the so-called classic drama. Assigned readings, reports, and discussions.

16. THE GERMAN VOLKSLIED MR. WILLIAMS
 Two credits (two hours per week) Second semester
 Open to graduate students who have completed course 9 or course 10.
 Outline of the history and development of the *Volkslied*. Study of selected numbers in Uhland's *Volkslieder* with references to other general and special collections. Influence of the Volkslied upon lyric and ballad writers.

18. SEMINAR IN SCIENTIFIC READING ASSISTANT PROFESSOR JUERGENSEN
 Four credits (two hours per week) Both semesters
 Open to graduate students who have completed course 9 or 10,
 and (by permission of the department) to undergraduates who
 have completed course 9 or 10; both semesters must be com-
 pleted before credit is given for the first semester.
 1908-9 The littérature of evolution (Haeckel, Reinke, etc.)
 1909-10 Chemistry and physics (Ostwald, Helmholtz, etc.)
 1910-11 Psychology and philosophy (especially Wundt.)
 For courses in Germanic philology see the statement of the department
 of comparative philology.

GREEK

FOR GRADUATES

18. SEMINAR IN GREEK TRAGEDY PROFESSOR BROOKS
 One credit (one hour per week) Second semester
 Open to juniors and seniors who have completed course 5.
 19. ADVANCED COURSE IN EPIC POETRY PROFESSOR HUTCHINSON
 Open to graduate students only; other arrangements may be
 ascertained upon application to the department.
 20. ADVANCED COURSE IN GREEK DRAMATIC POETRY PROFESSOR BROOKS
 Open to graduate students only; other arrangements may be
 ascertained upon application to the department.
 21. ADVANCED COURSE IN GREEK ORATORY ASSISTANT PROFESSOR SAVAGE
 Open to graduate students only; other arrangements may be
 ascertained upon application to the department.
 22. LATER GREEK (322 B. C. to 200 A. D.) PROFESSOR HUTCHINSON
 Open to graduate students only; other arrangements may be
 ascertained upon application to the department.
 23. ADVANCED COURSE IN MODERN GREEK PROFESSOR BROOKS
 Open to graduate students only; other arrangements may be
 ascertained upon application to the department.

HISTOLOGY AND EMBRYOLOGY

FOR UNDERGRADUATES AND GRADUATES

1. GENERAL VERTEBRATE MORPHOLOGY AND HISTOLOGY PROFESSOR LEE, ASSISTANT PROFESSOR NICKERSON
 Four and one-half credits (six lectures and recitations, three
 laboratory periods) First quarter
 2. MICROSCOPIC ANATOMY OF MAN AND VERTEBRATES PROFESSOR LEE, ASSISTANT PROFESSOR NICKERSON
 Four and one-half credits (six lectures and recitations, three
 laboratory periods) Second quarter
 3. MICRO-TECHNIQUE AND THE MORPHOLOGY OF THE SPECIAL SENSE
 ORGANS PROFESSOR LEE
 Four and one-half credits (six lectures and recitations, three
 laboratory periods) Third quarter
 7. CYTOLOGY AND HISTOGENESIS PROFESSOR LEE
 Two credits (four lectures and recitations, two laboratory
 periods) Third quarter
 Prerequisite courses 3 and 13 or equivalent.
 10. RESEARCH WORK IN HUMAN AND VERTEBRATE MORPHOLOGY PROFESSOR LEE
 Properly qualified students will be provided every facility for
 original investigation of anatomical problems.
 11. ELEMENTS OF VERTEBRATE EMBRYOLOGY PROFESSOR LEE,
 ASSOCIATE PROFESSOR JOHNSTON
 Four and one-half credits (six lectures and recitations, three lab-
 oratory periods) First quarter

12. ADVANCED VERTEBRATE EMBRYOLOGY	PROFESSOR LEE, ASSOCIATE PROFESSOR JOHNSTON
Three credits (six lectures and recitations, three laboratory periods)	Second quarter
13. SPECIAL EMBRYOLOGY OF MAN AND VERTEBRATES	PROFESSOR LEE
Four and one-half credits (six lectures and recitations, three laboratory periods)	Third quarter
17. EXPERIMENTAL EMBRYOLOGY	PROFESSOR LEE
Two credits (four lectures and recitations, two laboratory periods)	Fourth quarter
Prerequisite courses 3 and 13 or equivalent.	
20. THE ANIMAL PARASITES OF MAN	ASSISTANT PROFESSOR NICKERSON
One credit (hours to be arranged)	Third quarter
21. ELEMENTS OF MAMMALIAN NEUROLOGY	ASSOCIATE PROFESSOR JOHNSTON, DR. INGBERT
Three credits (two lectures and recitations, one laboratory period)	Second quarter
22. THE HUMAN NERVOUS SYSTEM	ASSOCIATE PROFESSOR JOHNSTON DR. INGBERT
Four and one-half credits (six lectures and recitations, three laboratory periods)	First quarter
23. SPECIAL AND APPLIED NEUROLOGY	ASSOCIATE PROFESSOR JOHNSTON DR. INGBERT
One credit (hours to be arranged)	Fourth quarter
24. NEUROLOGICAL TECHNIQUE	ASSOCIATE PROFESSOR JOHNSTON
Two credits (hours to be arranged)	Fourth quarter
26. THE NERVOUS SYSTEM AND MENTAL LIFE	ASSOCIATE PROFESSOR JOHNSTON
One credit (hours to be arranged)	Second quarter
27. COMPARATIVE NEUROLOGY OF VERTEBRATES	ASSOCIATE PROFESSOR JOHNSTON
One to three credits (hours to be arranged)	Second quarter
Intended for graduates; open by special permission to seniors who meet the requirements. Prerequisite courses 1 and 2, or 3 in Animal Biology, or courses 2 and 12 in Histology and Embryology.	
30. RESEARCH IN NEUROLOGY	ASSOCIATE PROFESSOR JOHNSTON
Problems and special work in vertebrate Neurology. Open only to those who are qualified to carry on investigation.	
40. ANATOMICAL JOURNAL CLUB AND SEMINAR	
Weekly meetings during year for reviews of the current literature and discussion of special topics in Anatomy, Histology, Embryology and Neurology, and of the research work being carried on in the department. The department library, which is large and rapidly growing, receives all the leading anatomical journals.	

HISTORY

FACILITIES

The department of history is equipped with library material for "practice courses" in research in American History, especially the colonial and revolutionary periods, in English and French medieval history, in the French Revolution, and in certain phases of European Nineteenth Century history. Valuable additions to the University resources in some of these lines are to be found in the excellent library of the State Historical Society, and in the State Library at the Capitol in St. Paul (thirty minutes distant), and in the City and Athenaeum libraries in Minneapolis.

In none of the lines mentioned, however, is the department satisfactorily prepared to give more than two years of graduate work, with due regard for economy of the student's time and energy. Therefore, if a student desires to take his doctorate in history here, he must be prepared, until the library facilities are materially improved, to do at least a third of his work in libraries elsewhere, under direction of the department.

COURSES OF INSTRUCTION

The following are "general courses" (lectures and reading, with study of selected documents and some research work). They are open to upper classmen in the undergraduate college who have completed one or two elementary courses there; and they may be taken as minors, or parts of minors, for the master's degree. Any one of them may be taken, also, for part of a major towards the master's degree, provided, (1) that the applicant has made large general preparation in other fields of history, and, (2) that the course chosen be accompanied by sufficient work in more intensive courses in the same field. Thus if an applicant is well prepared in European history, including English constitutional history, but has had little American history, he might be allowed a major in 5 followed by two, three, or four courses selected from 7-14.

FOR UNDERGRADUATES AND GRADUATES

3. THE RENAISSANCE AND REFORMATION PROFESSOR WHITE
 Three credits (three hours per week) First semester
 Open to those who have completed course 1 or course 2.
 The Renaissance and Reformation will be studied as general European movements, with the emphasis upon the work of individual men and upon ideas rather than upon politics and institutions. The purpose of the course will be to show how the medieval world became the modern world.

4. EUROPE SINCE 1789 PROFESSOR ANDERSON
 Six credits (three hours per week) Both semesters
 Open to those who have completed course 1 or 2.
 The history of France occupies the most prominent place in the course, that of other countries being grouped about it, as far as possible. Much attention is given to international affairs, the principal territorial changes being illustrated with a series of wall maps prepared for the course under the direction of the instructor. A special effort is made to put the students into a position to understand the present governments and politics of the leading European states. The entire class meets twice each week for lectures or recitations. The third exercise is devoted to the study of important historical documents, drawn principally from Anderson's *Constitutions and other Select Documents Illustrative of the History of France 1789-1901*. This work is done in small groups which meet in the European history seminar room.

5. AMERICAN CONSTITUTIONAL HISTORY TO 1840 PROFESSOR WEST
 Six credits (three hours per week) Both semesters
 Open to those who have completed course 2; required for courses 6 to 9 inclusive, 11, 13, 14, and 19, and therefore to students who intend to specialize in history recommended for the sophomore year.
 The aim is to make this a "practice course"; the work is done partly by co-operative topical reports, and students are expected to consult primary sources to a greater degree than is possible in most undergraduate courses. During part of the year the class will meet once a week in small sections for the study of documents.

6. AMERICAN CONSTITUTIONAL HISTORY, 1841-1885 PROFESSOR WEST
 Three credits (three hours per week) Second semester
 Open to those who have completed course 2 and at least the first semester of course 5; given in 1908-9, and in alternate years thereafter.
 Special attention is given to the development of the slavery issue in politics, the political history of the civil war, and reconstruction.

15. HISTORICAL METHOD AND BIBLIOGRAPHY PROFESSOR WHITE
 Two credits (two hours per week) Second semester
 Open to those who have completed course 1 or course 2, but designed only for those who intend to specialize in history.

This course aims to make clear to the student the genesis of the modern historical method and to introduce him in a practical way to the use of the best tools in historical study. The work divides naturally as follows:

1. Exercises in historical criticism and interpretation. One or more important historical sources will be studied intensively by the class.
2. History of historical writings; especially the work of Ranke and his followers and the origin of the seminar system. Some account will be taken of present methods and advantages of study in Germany and France.

3. Bibliography. Purpose, to gain a working knowledge of existing helps to historical study, such as standard bibliographies, historical magazines, source material, etc.

While the knowledge of Latin or the modern languages is an advantage, it is not a necessity in this course.

20. ENGLAND SINCE 1815 PROFESSOR ANDERSON
Three credits (three hours per week) Second semester
Open to those who have completed course 2; may be taken to advantage in connection with course 4; not given in 1908-9.

The course opens with a rapid survey from the point where course 1 stops down to 1815. From there on the work is more intensive. Through topics and assigned readings an opportunity is afforded to become acquainted with the principal British reviews and with two or three of the leading British newspapers.

21. HISTORY OF GREECE ASSISTANT PROFESSOR WESTERMANN
Three credits (three hours per week) First semester
Open to those who have completed course 1 or course 2.

The course is general in its nature and will cover the political and social development of the Greek states to the time of their incorporation into the Roman Empire, with particular emphasis upon the later part of the period. Especial attention will be given to the permanent influence of Greek civilization.

FOR GRADUATES

The following courses are "intensive" or "advanced" courses. Each one of them requires the completion of the corresponding "general" course in the list above. They may be taken, in proper combination, for majors for the master's degree, or, by ones or twos, for minors.

7. THE MAKING OF THE CONSTITUTION PROFESSOR WEST
Six credits (three hours per week) Both semesters
Open to juniors, seniors, and graduates, who have completed course 5, but only on approval of the instructor; both semesters must be completed before credit is given for the first semester.

Each member of the class studies in detail the transition in one of the original American colonies to commonwealth government, with the constitution of his chosen state. The work of the Philadelphia convention is then taken up and the accounts of later writers are compared with the sources. "We the people," the "compact" theory, and the province of the Supreme Court as "final arbiter," are topics especially investigated, with such further aids as the writings of the day and the discussions of the ratifying state conventions afford. Besides the class work each student will present a written report upon the history of some important bill providing for the admission of a state, and some constitutional question in connection with congressional legislation.

8. AMERICAN HISTORY SINCE 1789 AS SHOWN IN THE DEVELOPMENT OF CONSTITUTIONAL LAW PROFESSOR WEST
Three credits (three hours per week) First semester
Open to seniors and graduate students who have completed courses 2, 5, 6, and 7; not given in 1908-9.

This course is not designed to be a systematic treatment of either history or constitutional law. It consists of a careful analysis of cases selected from *Thayer's Cases on Constitutional Law*, studied in their historical setting and with reference to the course of development.

9. STUDIES IN AMERICAN STATESMEN PROFESSOR ANDERSON
Three credits (three hours per week) Second semester
Open to juniors, seniors, and graduate students, who have completed course 2 and at least the first semester of course 5.

A research course. Each member of the class makes a study of some prominent American statesman who has left a considerable body of materials valuable for information upon his own career and the general history of the United States. The greater part of the work consists in the sifting of these materials and the preparation of brief reports in regard to points assigned for investigation. The class exercises are chiefly devoted to the criticism of these reports and the synthesis of the results thus obtained. Only a limited period is traversed. In 1908-9 the work will be confined to the period of the Federalist supremacy, 1789-1801.

10. A CRITICAL STUDY OF A HISTORICAL MASTERPIECE PROFESSOR ANDERSON
 Three credits (three hours per week) First semester
 Open to those who have completed course 5.
 The object of this course is to develop the habit of reading history critically. Each year a masterpiece of historical literature will be minutely and critically studied. Each student will be required to read critically the entire work studied and, in addition, to analyze and report upon assigned portions of it. These reports will be made the basis of the class work, which will consist mainly of discussions carried on by the students under the direction of the instructor. In 1908-9 Rhodes' *History of the United States from the Compromise of 1850 to the Restoration of Home Rule in the South in 1877* will be read.

11. THE HISTORY OF AMERICAN DIPLOMACY PROFESSOR ANDERSON
 Three credits (three hours per week) First semester
 Open to seniors and graduates who have completed course 5.
 A research course dealing principally with the more important features of American foreign policy during the earlier years of the federal government.

12. THE HISTORY OF EUROPEAN DIPLOMACY SINCE 1789 PROFESSOR ANDERSON
 Three credits (three hours per week) Second semester
 Open to seniors and graduates who have completed or are taking course 4; ability to read easy French is required.
 This course centers about the critical reading of the principal treaties and numerous state papers dealing with international relations.

13. COLONIAL EXPANSION AND ADMINISTRATION PROFESSOR WEST
 Three credits (three hours per week) Second semester
 Open to seniors and graduates who have completed course 4 or course 5; given in alternate years; not offered in 1908-9.
 The history of the colonial acquisitions of the great nations will be surveyed rapidly and colonial institutions and governments will be studied and compared in detail.

14. A CRITICAL STUDY OF AUTHORITIES FOR EARLY NEW ENGLAND HISTORY PROFESSOR WEST
 Four credits (two hours per week) Both semesters
 Open to seniors and graduates who have completed eighteen credits, including course 5; both semesters must be completed before credit is given for the first semester; given in alternate years.
 This is primarily a course in historical criticism, based on a minute study of Winthrop's *History of New England*. Each member of the seminar has a group of secondary authorities assigned him which he is to criticise in the light of the original sources. The study involves also a careful comparison of the chief sources with one another, and incidentally it leads to a minute treatment of political, social, and economic development in early New England. The number admitted to the course is limited to seven.

18. ORIGIN OF THE ENGLISH JUDICIAL SYSTEM PROFESSOR WHITE
 Three credits (three hours per week) Second semester
 Open to juniors, seniors, and graduates, who have completed six credits, including course 2, and obtain the permission of the instructor; students must be able to read medieval Latin, and course 9 in the Latin department is recommended to give this preparation.
 The work will consist of detailed study in the sources of the twelfth and thirteenth centuries, and will aim to show how the kings' court, from which the present judicial system has grown, superseded the older communal and private courts, the development of the primitive king's court into a system of courts, and the growth in it of a new procedure. In this last connection the critical stages in the early history of the jury will receive special attention.

19. THE EXPANSION OF AMERICA, STUDIED IN ITS HIGHWAYS OF EMIGRATION PROFESSOR WEST
 Six credits (three hours per week) Both semesters
 Open to seniors and graduates who have completed course 5; both semesters must be completed before credit is given for the first semester; not given in 1908-9.
 This is a study of roads and methods of pioneer travel in that westward movement of population which extended the inhabited area of the United States from the seaboard to the Mississippi.

22. GREEK POLITICAL INSTITUTIONS ASSISTANT PROFESSOR WESTERMANN
Three credits (three hours per week) Second semester
Open to juniors, seniors, and graduates, who have completed
courses 1 or 2, 21, and six additional credits.

A study of the development of Greek political forms and of their operation as seen in typical oligarchic, democratic, federal, and monarchic states.

23. ROMAN IMPERIAL ORGANIZATION ASSISTANT PROFESSOR WESTERMANN
Three credits (three hours per week) Second semester
Open to juniors, seniors, and graduates, who have completed
twelve credits.

This course will survey the development and organization of the imperial system from the beginning of Roman expansion outside of Italy to the time of the Germanic invasion. Special attention will be given to the administration of the municipalities and provinces under the Empire and to the development of despotism.

HORTICULTURE

Equipment. The library of the division of horticulture is well equipped with literature and periodicals devoted to this subject, all of which are well indexed. The campus, orchards, nurseries, fruit gardens and greenhouses at the University farm afford good illustrations and opportunities for study and experiment work. The new fruit breeding farm offers the best of facilities for the study of this important line of work.

Graduate work is offered to those who are prepared to pursue it to advantage. Two courses are offered but others will be given if conditions seem to make it desirable.

1. GENERAL POMOLOGY PROFESSOR GREEN
A general course in the study of cultivated fruits.

2. PLANT BREEDING PROFESSOR GREEN
A general course in the study of the origin and development of
cultivated varieties.

LATIN

FOR UNDERGRADUATES AND GRADUATES

6. ADVANCED COURSE IN CAESAR PROFESSOR PIKE
Three credits (three hours per week) First semester
Open to those who have completed courses 1 to 4 inclusive; required for a teacher's recommendation in Latin.

Selections from books five to seven of the Gallic War and from the Civil War. Thorough study of the principles of indirect discourse. Intermediate Latin composition. An amount of time approximately equal to one hour for one-half semester will be spent upon the technical portions of the work, e. g., class drill work and discussion of various problems connected with secondary school work in Latin.

7. ADVANCED COURSE IN VIRGIL PROFESSOR PIKE
Three credits (three hours per week) Second semester
Open to those who have completed courses 1 to 4 inclusive; required for a teacher's recommendation in Latin.

An interpretation of selections from books seven and twelve of the Aeneid; a study of the quantitative method of pronouncing Latin verse; practice in the metrical rendering of selected passages. An amount of time approximately equal to one hour for one-half semester will be spent upon the strictly technical portions of the subject.

8. PLINY'S LETTERS PROFESSOR PIKE
Two credits (two hours per week) First semester
Open to those who have completed courses 1 to 4 inclusive.

Selections from the correspondence of Pliny the Younger with a study of his times.

10. LATIN COMPOSITION PROFESSOR PIKE
Two credits (two hours per week) Second semester
Open to those who have completed course 1 to 4 inclusive.
A course in advanced Latin composition and a study of Latin prose style.

11. ROMAN ELEGIAC POETRY PROFESSOR CLARK
 Three credits (three hours per week)
 Open to those who have completed courses 1 to 4 inclusive.
 Selections from Catullus, Tibullus, Propertius, and Ovid, with a study of the rise, development, and characteristics of Roman elegiac poetry.

12. CORRESPONDENCE OF CICERO PROFESSOR CLARK
 Two credits (two hours per week)
 First semester
 Open to those who have completed courses 1 to 4 inclusive.
 Selections from the letters of Cicero, with a study of his life and the history of his times.

13. ROMAN SATIRE PROFESSOR CLARK
 Three credits (three hours per week)
 Second semester
 Open to those who have completed courses 1 to 4 inclusive.
 Selections from Juvenal, Persius, Horace, and from early satire, with a study of the rise, development, and characteristics of Roman satire.
 Courses 6 and 7 are open as minors only on permission of the professor in charge.

FOR GRADUATES

17. LUCRETIUS PROFESSOR CLARK
 Three credits (two hours per week)
 Both semesters
 Open to graduate students; other arrangements may be ascertained upon application to the department.
 The course consists of the reading and interpretation of the text of Lucretius with a study of his philosophy and its sources.

18. SENECA PROFESSOR PIKE
 Three credits (two hours per week)
 Both semesters
 Open to graduate students; other arrangements may be ascertained upon application to the department.
 Reading, interpretation and annotation of the *de Beneficiis* of Seneca with a study of Stoicism at Rome.

19. THE HISTORY AND THEORY OF ROMAN ELOQUENCE ASSISTANT PROFESSOR GRANRUD
 Three credits (two hours per week)
 Both semesters
 Open to graduate students; other arrangements may be ascertained upon application to the department.
 The *Brutus* of Cicero will form the basis of the work during the first semester and the *Orator* during the second semester.

LAW

FIRST GRADUATE COURSE

1. PHILOSOPHIC BASIS OF JURISPRUDENCE DEAN PATTEE
 For the degree of Master of Laws. This course constitutes an inquiry into the nature of law in its most general signification. It considers the truths of reason, the "laws of nature," so-called, and the positive law or jurisprudence. It considers the nature of international and municipal law, and illustrates by means of judicial authorities how the primary truths of reason operate in the realm of human law.

2. SCIENCE OF THE STATE
 This course considers the segregation from the comprehending science of politics, and the co-ordinate sciences of government and jurisprudence. The citizen and subject population; the territory, its existence and content, subdivisions, relation of people to the land, comparison of great and small states; theories of the state; liberty and opportunity as the ends of the state; the state as the organ of power, and guardian of rights; the essential of constitutions.

3. CONSTITUTIONAL HISTORY AND JURISPRUDENCE.
 This course is devoted to a critical study of the "dual system" of constitutional government of which the American Republic is the conspicuous example. The Federal constitution and the State constitutions are illustrated separately in both their historical and their legal aspects, as distinct parts of one system, but which are designed to work harmoniously in unison, and are

both necessary to the successful operation of the system. The Federal courts are shown to have so conducted the administration of their high duties as to have contributed to the proper development of the State side of the system, and to have made the Federal Government the firm bulwark of local self-government in the States.

Those who enter this course as candidates for the degree must have already received the degree of bachelor of laws, from this or some other law college having a three years course of study. Those who spend the entire year in the work prescribed for this course, and pass a satisfactory examination upon the subjects taken, will be entitled to the degree of master of laws.

But no graduate of another law school, who has not been admitted to the bar of Minnesota, will be matriculated in this course as a regular student for the degree of LL. M.; but any person who possesses the requisite legal learning may enter the course as a special student and pursue any or all of the studies offered.

SECOND GRADUATE COURSE

Students who have received the degree of LL. B., from this or some other law school requiring three years' study of law for said degree, and who have also received the degree of LL. M., from this or some other school after not less than one year of graduate study, and who have taken high rank in all the studies leading to these degrees, may apply to the faculty for the degree of Doctor of Civil Law. A knowledge of French or German, as well as of Latin is required, and special proficiency in Roman history is necessary to entitle a student to candidacy for such degree.

There is no prescribed time within which students are required to do their work in this course, but they must make themselves proficient in the subjects of Roman law, political science, comparative constitutional law, and the philosophy of jurisprudence before any thesis will be accepted from them.

None of the aforementioned degrees will be conferred until a satisfactory thesis is presented to the faculty by the student, and the thesis for the doctor's degree must be one evincing original investigation and special excellence.

Whether a class will be organized in this course during the current academic year will depend upon the number of applicants for admission.

MATHEMATICS FOR UNDERGRADUATES AND GRADUATES

10. DIFFERENTIAL EQUATIONS PROFESSOR DOWNEY
Three credits (three hours per week) Second semester
Open to those who have completed courses 3 to 7 inclusive.
Text and lectures.

11. ADVANCED COURSE IN PLANE ANALYTICAL GEOMETRY PROFESSOR BAUER
Three credits (three hours per week) First semester
Open to those who have completed courses 3 to 6 inclusive.
Supplementary to course 5, treating more fully some of the subjects of that course and taking up additional subjects.

12. SOLID ANALYTICAL GEOMETRY PROFESSOR BAUER
Three credits (three hours per week) Second semester
Open to those who have completed courses 3 to 8 inclusive.
A lecture course. Elementary theorems of projection, co-ordinates, the plane, the line in space, quadric surfaces, transformation of co-ordinates, tangents, poles and polars, the general equation of the second degree. Numerous examples are assigned to illustrate the theory.

14. METHOD OF LEAST SQUARES PROFESSOR LEAVENWORTH
Two credits (two hours per week) Second semester
Open to those who have completed courses 3 to 7 inclusive.
A study of the combination and adjustment of observations and the discussion of their precision as applied especially to engineering physics, and astronomy.

16. ADVANCED DIFFERENTIAL AND INTEGRAL CALCULUS PROFESSOR DOWNEY
Four credits (two hours per week) Both semesters
Open to graduate students who have completed courses 3 to 7 inclusive.

This course goes farther into some of the subjects treated in courses 6 and 7 and takes up some important subjects not included in those courses.

17. THEORY OF CURVES AND SURFACES PROFESSOR BAUER
 Four credits (two hours per week) Both semesters
 Open to graduate students who have completed courses 3 to 7
 inclusive and 10 and 12.
 This is a course in differential geometry. The fundamental equations of the theory of curves and of surfaces will be developed. The work will be based upon Scheffer's *Theorie der Curven und Flächen*.

18. THE GALOIS THEORY OF EQUATIONS ASSISTANT PROFESSOR BUSSEY
 Four credits (two hours per week) Both semesters
 Open to graduate students who have completed courses 3 to 9
 inclusive.

19. THEORY OF FUNCTIONS OF A COMPLEX VARIABLE DR. MANCHESTER
 OR MR. DALAKER
 Four credits (two hours per week) Both semesters
 Open to graduate students who have completed courses 1 to 10
 inclusive.
 Lectures, readings, and problems.

20. PROJECTIVE GEOMETRY ASSISTANT PROFESSOR BUSSEY
 Four credits (two hours per week) Both semesters
 Open to graduate students who have completed courses 3 to 7
 inclusive and courses 11 and 12.

MATHEMATICS AND MECHANICS

FOR GRADUATES AND UNDERGRADUATES

15. DESCRIPTIVE GEOMETRY PROFESSOR KIRCHNER
 Four credits (two hours per week) Both semesters
 Open to those who have completed courses in drawing 3 to 5
 inclusive; both semesters must be completed before credit
 is given for the first semester.
 Problems relating to points, lines, planes, solids, surfaces of revolution and warped surfaces; orthographic, isometric, horizontal, oblique, and perspective projections; shades and shadows. Recitations, lectures, and practice.

7'. STRENGTH AND RESISTANCE OF MATERIALS PROFESSOR EDDY
 Five credits (five hours per week)
 Required of all juniors in the civil engineering course. Before registration for this course the student must pass the required physics of sophomore year in addition to the required mathematics of the two preceding years. Bars, beams, shafts, columns, reinforced concrete, hollow cylinders and spheres, rollers, and plates and the general theory of internal stress.

7a'. APPLIED MECHANICS PROFESSOR BROOKS, ASSISTANT PROFESSOR NEWKIRK
 Five credits (five hours per week) First semester
 Required of all juniors in the mechanical and electrical engineering courses. Prerequisites the same as course 7. The principles of statics and dynamics, and the mechanics of the materials of construction.

8'. HYDRAULICS AND PUMPING MACHINERY PROFESSOR EDDY, PROFESSOR BROOKE, ASSISTANT PROFESSOR NEWKIRK
 Five credits (five hours per week) Second semester
 Required of all juniors. Prerequisite course 7 or 7a. Laws of the equilibrium, pressure and flow of liquids; theory of the action of pumps, compression and flow of gases.

9'. THERMODYNAMICS OF STEAM AND GAS ENGINES PROFESSOR EDDY
 Three credits (three hours per week) First semester
 Required of all candidates for degrees in mechanical and electrical engineering. Prerequisite, course 8'. The mechanical theory of heat as applied to steam, oil, gas and hot air engines and to compressors, including the use of steam tables, entropy diagrams, etc.

10'. WATER TURBINES PROFESSOR EDDY
Two credits (two hours per week) First semester
Required of all candidates for degrees in mechanical and electrical engineering, except those who elect either railway engineering or telephony. Theory of the operation, construction and regulation of turbine wheels.

11'. STEAM TURBINES PROFESSOR EDDY
Two credits (two hours per week) Second semester
Open to all who have had courses 9 and 10. Various types of turbines, velocity, impulse and reaction; nozzles, vanes, discs, bearings, governors, thermodynamic analysis and efficiency.

12'. REFRIGERATING MACHINERY PROFESSOR EDDY
(Two credits, two hours per week) Second semester

FOR GRADUATES

26. PERSPECTIVE PROFESSOR KIRCHNER
Three credits (three times per week)
The principles and practice of perspective, including shadows, reflections, distortions, corrections, systems, methods, the practical problem, and inverse constructions.

27. HISTORY OF MATHEMATICS PROFESSOR HAYNES
Two credits (twice per week)
Lectures and reading, under direction of works in the mathematical library on the ancient and modern development of mathematics.

28. ELLIPTIC INTEGRALS ASSISTANT PROFESSOR BROOKE
Four credits (two hours per week) Both semesters
Courses in the following related subjects in mathematics, mathematical physics and theoretical mechanics are open to those who have had sufficient preparation.

13. DIFFERENTIAL EQUATIONS.
14. ANALYTICAL STATICIS AND POTENTIAL FUNCTIONS.
15. SPHERICAL HARMONICS.
16. THEORY OF ELECTRICITY AND MAGNETISM.
17. ANALYTICAL THEORY OF THE CONDUCTION OF HEAT.
18. THEORY OF ELASTICITY AND SOUND.
19. ELECTRO-MAGNETIC THEORY OF LIGHT.
20. HYDRODYNAMICS AND FLUID MOTION.
21. DYNAMICS OF RIGID BODIES.
22. ELLIPTIC FUNCTIONS.
23. THEORY OF FUNCTIONS OF THE COMPLEX VARIABLE.
24. DIRECTIONAL CALCULUS, VECTOR ANALYSIS, DETERMINANTS
25. KINETIC THEORY OF GASES.

MECHANICAL ENGINEERING

FOR UNDERGRADUATES AND GRADUATES

9. SHOP ECONOMICS PROFESSOR FLATHER
Two credits (two hours per week) Second semester
Senior elective.
Shop and factory organization and management; cost systems.

13. MACHINE DESIGN PROFESSOR FLATHER AND MR. MARTENIS
Five credits (ten hours per week) First semester
Required of seniors. M. E. and E. E. courses. Open only to students pursuing course M. 7.
Calculation and design of such machine parts as fastenings, bearings, rotating pieces, pulleys and spur gearing. Recitations, lectures and drawing-room practice.

14. **MACHINE DESIGN** PROFESSOR FLATHER, MR. MARTENIS
 Three credits (six hours per week) Second semester
 Required of seniors, M. E. course. Open only to those pursuing
 course 20.
 Continuation of course 13. Rope driving; bevel gears, spiral
 gears. Also application of graphical methods to the design
 of valve gears and link motions. Zeuner diagrams, indicator
 cards. Lectures and drawing-room practice.

15. **MACHINE DESIGN** PROFESSOR FLATHER
 Four credits (eight hours per week) First semester
 Required post senior year, M. E. course. Preparation: courses 14
 and 19.
 Steam engine. Calculations and working drawings for a high
 speed automatic steam engine. Theoretical diagrams and de-
 termination of details.
 Gas engine. An alternative course in gas engine design is offered
 those who have completed course 21.

16. **MACHINE DESIGN** PROFESSOR FLATHER
 Four credits (eight hours per week) Second semester
 Required, post senior year, M. E. course. Preparation: course
 13.
 Original designing, including machinery for changing size and
 form. Boiler design, cranes, pumping and transmission ma-
 chinery and engineering appliances. Lectures, problems and
 drawing-room practice.

17. **TOOL DESIGN** PROFESSOR FLATHER
 Two to four credits (four or eight hours per week) First or second semester
 Elective. Preparation: courses 6, 13.
 Design of special tools for manufacturing interchangeable parts;
 jigs and milling fixtures.

18. **ENGINEERING DESIGN** PROFESSOR FLATHER
 Two or four credits (four or eight hours per week) First or second semester
 Elective. Preparation: courses 19, 20.
 Problems, designs and estimates for power plants, central sta-
 tions and factory equipment. Selection of motive powers, re-
 lative advantages of steam and producer gas plants; choice of
 engines and boilers; water powers; power distribution, dyna-
 mos and motors; pumps, shafting, piping and accessory plant.

19. **STEAM BOILERS** MR. SHOOP
 One credit (one hour per week) First semester
 Senior year. Open only to students pursuing course M. 7.
 Application of theory and practice in the design and con-
 struction of steam boilers, chimneys, boiler settings, and ac-
 cessories, smoke prevention, mechanical stokers; methods of
 operating boilers with safety and economy.

20. **STEAM ENGINE** PROFESSOR FLATHER
 Three credits (three hours per week) Second semester
 Senior year, preparation: course 7 M.
 Mechanics of the steam engine. Work in the cylinder; effect
 of reciprocating parts; steam distribution. Mechanism of the
 steam engine. A study of the details of modern steam engines,
 valves and valve gears. A study of the slide valve, link mo-
 tions, and other reversing gear; automatic cut-off gears and
 the Zeuner diagram. The steam engine indicator. Principles
 and operation of the instrument, indicator rigging; indicator
 cards; compounding.

21. **GAS ENGINES AND PRODUCERS** MR. SHOOP
 Two credits, (two hours per week) Second semester
 Senior year. Open only to students pursuing course C. 6.
 Principles of operation of two cycle and four cycle engines;
 cylinder construction and arrangement; valve gears and start-
 ing mechanisms; system of speed control, ignition and cooling.
 Application of the indicator and consideration of indicator dia-
 grams.

A study of the power gas producer including suction and pressure types for various fuels; construction and operation of the generator and accessory apparatus. Application to various industrial purposes. Recitations and lectures.

22. **MECHANICAL ENGINEERING** PROFESSOR FLATHER
Two credits (two hours per week) First semester
Post senior, preparation: course 8 M.
MEASUREMENT OF POWER. A study of the methods employed in measuring power. Dynamometers. Prony brakes; measurement of water power; water meters; weir measurement, flow of water in pipes; measurement of electric power, efficiency of motors, power required to drive machine tools and shafting. Recitations and lectures.
Two credits (two hours per week) Second semester
Preparation: course M. 8.
Air compressors and motors, and the transmission of power by compressed air. Recitations and lectures.

23. **MECHANICAL ENGINEERING** MR. MARTENIS
Three credits (six hours per week) First semester
Elective. Post senior year.
Heating and ventilation. Principles of heating and ventilation. Construction and operation of heating apparatus. Steam, hot water, exhaust, vacuum and fan systems. Lectures, recitations and design.
SEMINAR. Open to the seniors and post seniors once a week.

The following courses are available to students desiring to prepare themselves for special work in railway engineering.

24. **RAILWAY TECHNOLOGY** MR. MARTENIS
Two credits (four hours per week) First semester
Post senior. Railway M. E. course.
The object of this course is to familiarize the student with the principal details of construction of locomotives, and consists in part of a systematic course of visits to the various railroad shops in the vicinity; lectures and recitations.

25. **RAILWAY DESIGN** PROFESSOR FLATHER
Four credits (eight hours per week) First and second semesters
Post senior. Preparation: course 24.
(a) Of link and valve motions. Continuation of course 12 with special applications of the Stephenson link.
(b) Of locomotive and car details.
(c) Of the locomotive boiler.
(d) Of assembled parts.

26. **LOCOMOTIVE CONSTRUCTION** PROFESSOR FLATHER
Two credits (two hours per week) Second semester
Post senior. Preparation: course 24.
Lectures, reading and recitations on design and construction of locomotives, supplementing course 24. This treats:
(a) Of parts not involving the boiler and the use of steam; but including the carriage, as frames, springs and equalizing arrangements, running gear, brakes, trucks, lubrication.
(b) Of locomotive boilers and connected parts. Types, proportions, grates, flues, smoke-box arrangements and stacks, riveted joints, bracing and staying. Lagging, smoke prevention.
(c) Of the locomotive engine. Details, heat insulation, cylinder proportion for various types, weight on drivers, special service; crank effort diagrams with inertia of reciprocating parts, cylinder and receiver ratios for compound engines, starting valves for compounds.

27. **LOCOMOTIVE ROAD TESTING** PROFESSOR FLATHER
Post senior. Second semester

28. **SPECIFICATIONS** PROFESSOR FLATHER
 One credit (one hour per week) Second semester
 Post senior year, M. E. course.
 A study of engineering specifications. Classes of specifications; essential features; clauses; details. Examples. Lectures, recitations and practice in writing specifications.

FOR GRADUATES.

Courses are offered in:
 Engineering design.
 Experimental investigation.
 Railway engineering.

MINERALOGY

FOR UNDERGRADUATES AND GRADUATES

4. **OPTICAL MINERALOGY** MR. GROUT
 Three credits (six hours per week) Second semester
 Open to juniors and seniors who have completed course 1.
 A study of the microscopic structure of crystals and crystal grains. An application of methods used in determining minerals by their optical properties; goniometric and staurometric practice, embracing the elements of lithology. Lectures and laboratory work.

5. **THE MORPHOLOGY OF MINERALS** MR. GROUT
 Three credits (three hours per week) First semester
 Open to juniors and seniors.
 A study of crystallography, embracing projection and the geometric relations of crystal planes. The identification of minerals from crystal measurement and mathematical calculation. Crystal nomenclature.

6. **PHYSIO-CHEMICAL METHODS WITH THEIR APPLICATIONS** MR. GROUT
 Three credits (three hours per week) Second semester
 Open to seniors.
 The method of micro-chemical analysis described and demonstrated; the leading elements found in minerals are determined through the aid of crystalline precipitates of known compounds. Special attention is given to the study and determination of the rock-making minerals.

7. **AN OUTLINE OF MINERALOGY** MR. GROUT
 Two credits (one hour per week) Both semesters
 Open to juniors and seniors.
 A study of methods of identification of minerals, with their applications. Conferences, reading, and demonstrations.

FOR GRADUATES

8. **ORIGINAL PROBLEMS IN MORPHOLOGICAL AND PHYSICAL MINERALOGY** PROFESSOR HALL AND MR. GROUT
 Both semesters
 Open to graduate students; other arrangements may be ascertained upon application to the department.
 Investigations in mathematical crystallography and its application to crystal development and structure. Further applications than are made in course 4 of the optical characters of minerals in identification of mineral species.

9. **SPECIAL INVESTIGATIONS IN CHEMICAL AND PHYSICAL MINERALOGY** MR. GROUT
 Open to graduate students; other arrangements may be ascertained upon application to the department.
 Special attention is here given to tenacity and electrical properties and their relation to crystal form, cleavage and fracture. Dimorphous compounds are investigated and the conditions governing their formation studied. The physical properties of artificial mineral compounds are compared with those of natural minerals.

10. MINERAL OCCURRENCES AND ASSOCIATION PROFESSOR HALL AND MR. GROUT

Both semesters

Open to graduate students; other arrangements may be ascertained upon application to the department.

A discussion of genetic relationships. Field work in connection with the different phases of the particular problem in hand.

The equipment of the department of geology and mineralogy is sufficient for many lines of graduate work. The department has collected from many localities, both within and without the state, and the Geological Survey made extensive collections during the years of its active field work. The material thus gathered, the published literature on the state and the field within easy access from the University afford suggestions of unsolved problems in a number of different geological lines.

PATHOLOGY AND BACTERIOLOGY

The present courses in general pathology and bacteriology for medical and engineering students are offered as minors for Ph. D. and as majors for the master's degree.

A major for the Ph. D. shall consist of research in pathology for medical or experimental medicine, prerequisite to which certain of the regular courses offered in this department must be satisfactorily completed.

Before entrance into any course offered in this department, a working knowledge of certain groups of subjects such as histology and embryology, animal biology, anatomy, physiology, botany, chemistry, physics, etc., must be had.

1. GENERAL BACTERIOLOGY PROFESSOR WESBROOK, ASSISTANT PROFESSOR HILL AND DR. PRATT

Lectures and demonstrations. The general scope of bacteriology, the history of its development and the biological and chemical problems involved in the life history of bacteria will be dealt with. The classification of the various bacterial forms, the methods of isolation and culture and the composition and manufacture of culture media will be studied until a thorough knowledge of technique is acquired. General and special study of the various antisepsics, disinfectants and bactericidal substances and conditions will be undertaken.

Laboratory work, involving the making of their own culture media by the students, the study of bacteria in cultures and under the microscope, technique of staining and other methods, including observations of chemical and biological peculiarities, will be thoroughly carried out. Testing of various germicides—chemical and physical—and the use of bacteriological methods in the examination of drinking water will form an important part of the work. Bacterial activities concerned in sewage purification, etc., will receive attention. Twenty hours per week during the last eight weeks of the second semester, second year.

2. GENERAL PATHOLOGY PROFESSOR WESBROOK, DR. MULLIN AND DR. ROBERTS

Twenty hours per week during the last eight weeks of the second semester, second year.

Lectures, demonstrations and laboratory work on the general processes involved in disease to include the study of inflammation, the degenerations and tumors.

PHARMACY**THE GRADUATE COURSE IN THE COLLEGE OF PHARMACY**

In addition to its regular undergraduate course this college offers two graduate courses, the first continuing through one college year and leading to the degree of "master of pharmacy," and the second continuing through an additional year or longer, and leading to the degree of "doctor of pharmacy." The first graduate course, the one leading to the master's degree, is now in operation. It is intended that the curriculum shall include higher pharmaceutical chemistry, pharmaceutical assaying, higher organic chemistry, proximate and ultimate analysis, chemistry of food, spectroscopic work, therapeutics, and bacteriology, and a thesis of at least 3,000 words, embodying the results of original work, but this curriculum may be changed by the faculty if occasion or experience require.

The requirements for admission are a diploma from a Minnesota high school of the first grade, or an equivalent; a diploma from a college of pharmacy whose curriculum, extent and kind of work and length of undergraduate course are equal to those of the undergraduate work of this college; an acquaintance with either German or French sufficient to enable the student to read and understand the scientific literature of those languages, and a certificate of registration as pharmacist from any state board of pharmacy. The fees for this course will be seventy-five dollars, and, upon graduation, an additional fee of ten dollars for diploma. The rules relating to damage, waste and breakage in laboratories are the same as those applying to the undergraduate course.

The course leading to the doctor's degree will begin as soon as there are sufficient applicants.

PHILOSOPHY AND PSYCHOLOGY

FOR UNDERGRADUATES AND GRADUATES

3. EDUCATIONAL PSYCHOLOGY ASSISTANT PROFESSOR MINER AND MR. HAYNES
 Three credits (three hours per week) Second semester
 Open to those who have completed course 1.
 The study of mental developments in its relation to heredity and training. Lectures and student reports on the facts and theories of childhood and adolescence with special reference to their bearing on education.

5. EXPERIMENTAL PSYCHOLOGY: HIGHER MENTAL PROCESSES ASSISTANT PROFESSOR MINER
 Three credits (three hours per week) Second semester
 Open to juniors and seniors who have completed courses 1 and 4.
 A continuation of course 4 with experiments on affection, memory, attention, and such other processes as can be studied by laboratory methods. The quantitative phase of experimental psychology is taken up for special discussion.

6. OUTLINE OF EXPERIMENTAL PSYCHOLOGY ASSISTANT PROFESSOR MINER
 Three credits (three hours per week) Second semester
 Open to juniors and seniors who have completed course 1; not given in 1908-9.
 A study of the methods and accredited results of experimental investigation in psychology. Class-room demonstrations, lectures, and discussion.

7. PSYCHOLOGICAL INTERPRETATION ASSISTANT PROFESSOR MINER
 Three credits (three hours per week) First semester
 Open to juniors and seniors who have completed course 1.
 Unusual and pathological mental states are studied for the light they throw upon normal mental life. The student is given drill in the detecting of mental defects and in the psychological explanation of characters in history and literature. The subconscious, dreams, suggestibility, telepathy, nervous disorders, insanity, secondary personalities, and the crowd are among the topics treated.

8. PSYCHOLOGICAL PRINCIPLES ASSISTANT PROFESSOR SWENSON
 Three credits (three hours per week) Second semester
 Open to juniors and seniors who have completed courses 1 and 2.
 An advanced course treating in detail some of the more important theoretical problems connected with psychology. The discussions will center about the methods and aim of the science, its fundamental principles, and its relations to other sciences, regard being had to the general outlines of historical development in these respects.

9. ANCIENT AND MEDIAEVAL PHILOSOPHY PROFESSOR WILDE
 Three credits (three hours per week) First semester
 Open to juniors and seniors who have completed course 1 or course 2.
 This and the following course are designed to give such an outline of the history of thought as is desirable in a general education. Emphasis is placed upon the human significance of philosophy rather than upon its purely technical aspect. In this first semester the main work will be upon the philosophies of Plato and Aristotle, but the later development will be traced as far as the Renaissance.

10. MODERN PHILOSOPHY PROFESSOR WILDE
 Three credits (three hours per week) Second semester
 Open to juniors and seniors who have completed course 1 or course 2.

Lectures on the representative systems of modern philosophy from the Renaissance to our own day, the purpose of the course being to prepare the student to understand the philosophical tendencies of the present. The work will include a study of Bacon, Descartes, Spinoza, Leibnitz, Locke, Berkeley, Hume, Kant, Mill, Schopenhauer.

11. PRINCIPLES OF ETHICS PROFESSOR WILDE
 Three credits (three hours per week) First semester
 Open to juniors and seniors who have completed course 1 or course 2.

An introductory course, comprising a study of the distinction between moral and non-moral phenomena; an analysis of voluntary conduct, and a discussion of the nature of conscience, the meaning of right and wrong, the purpose of life, human responsibility, and the authority of moral law.

12. PHILOSOPHY OF RELIGION PROFESSOR WILDE
 Three credits (three hours per week) Second semester
 Open to juniors and seniors who have completed course 1 or course 2.

A study of the religious consciousness, its origin, development and significance; an analysis of the conception of God and a discussion of the place and function of religion in modern life.

ADVANCED INTENSIVE COURSES

13. LOGIC OF SCIENCE ASSISTANT PROFESSOR SWENSON
 Three credits (three hours per week) Second semester
 Open to juniors and seniors who have completed course 2.

This course serves as an introduction to philosophy through the medium of the special sciences, its aim being to suggest a system of the sciences through a discussion of the nature and relations of their fundamental principles.

FOR GRADUATES

Courses from the following list will be offered to graduates each year as determined by the needs and qualifications of the students presenting themselves. It is desirable that students consult with the department as early in the session as possible in order that the course and hours may be arranged to suit the greatest number.

14. PSYCHOLOGICAL PROBLEMS ASSISTANT PROFESSOR MINER
 Both semesters
 Open to seniors and graduate students who have completed courses 1, 4, and 5; other arrangements may be ascertained upon application to the department.

Original work on special topics.

15. RESEARCH IN PSYCHOLOGY ASSISTANT PROFESSOR MINER
 Both semesters
 Six credits (three hours per week) Both semesters
 Open to graduate students who have completed course 14; both semesters must be taken before credit is given for the first semester.

Minor or major research in experimental, educational, analytic, genetic, or comparative psychology.

16. THE PHILOSOPHY OF DESCARTES, SPINOZA, AND LEIBNITZ ASSISTANT PROFESSOR SWENSON
 Both semesters
 Six credits (three hours per week) Both semesters
 Open to seniors and graduates who have completed courses 1, 2, 9, and 10; both semesters must be completed before credit is given for the first semester.

A study of the pre-critical period of modern philosophy. The work will center in the discussion of the *Ethics* of Spinoza and *Monadology* of Leibnitz.

17. THE PHILOSOPHY OF KANT ASSISTANT PROFESSOR SWENSON
 Six credits (three hours per week) Both semesters
 Open to seniors and graduate students who have completed courses 1, 2, 9, and 10; both semesters must be completed before credit is given for the first semester.
 A critical reading of the three Critiques; the relation of Kant to the development of modern philosophy.

18. THE PHILOSOPHY OF HUME ASSISTANT PROFESSOR SWENSON
 Six credits (three hours per week) Both semesters
 Open to seniors and graduates who have completed courses 1, 9, and 10; both semesters must be completed before credit is given for the first semester.
 A critical reading of Hume's philosophical works; the position of Hume in the development of English philosophy.

19. THE PHILOSOPHY OF HERBERT SPENCER ASSISTANT PROFESSOR SWENSON
 Three credits (three hours per week) Second semester
 Open to seniors and graduate students who have completed courses 1 and 2.
 A critical reading of the *First Principles* with references to other important features of the *Synthetic Philosophy* and to the philosophical character of the modern scientific movement. The course is intensive, the aim being to develop the power of philosophical criticism in regard to such questions as the logical foundations of the theory of evolution, the relations of science and religion, and the place of the scientific interest among the other interests of life.

20. METAPHYSICS ASSISTANT PROFESSOR SWENSON
 Six credits (three hours per week) Both semesters
 Open to seniors and graduate students who have completed course 9 and course 10 or 11; both semesters must be completed before credit is given for the first semester.
 A critical and constructive discussion of theories of knowledge and reality.

21. SYSTEMATIC ETHICS PROFESSOR WILDE
 Six credits (three hours per week) Both semesters
 Open to seniors and graduate students who have completed courses 9, 10, and 11; both semesters must be completed before credit is given for the first semester.
 A detailed study of the principles of conduct and the basis of moral obligation.

22. HISTORY OF ETHICS PROFESSOR WILDE
 Six credits (three hours per week) Both semesters
 Open to seniors and graduate students who have completed courses 9, 10, and 11; both semesters must be completed before credit is given for the first semester.
 A critical study of the development of Greek, English, and German ethical thought. Chief attention will be paid to the work of Plato and Aristotle in ancient times, and to the relation between utilitarianism and idealism in modern philosophy.

23. GERMAN IDEALISM PROFESSOR WILDE
 Six credits (three hours per week) Both semesters
 Open to graduate students who have completed courses 9, 10, and 17; both semesters must be completed before credit is given for the first semester; a knowledge of German is required.
 A study of the development of German philosophy after Kant, especially as found in the writings of Fichte and Hegel.

PHYSICS

FOR UNDERGRADUATES AND GRADUATES

5. ADVANCED GENERAL PHYSICS PROFESSOR JONES, ASSISTANT PROFESSORS ANTHONY ZELENY AND ERIKSON
 Six credits (seven hours per week) First semester
 Open to sophomores, juniors, and seniors, who have completed mathematics 4, (trigonometry); the laboratory fee is three

dollars; adapted to those students who expect to specialize in physics, to teach the science, or to enter upon a technical course.

Mechanics of solids and fluids, the properties of matter, heat, and sound. This course is intended to give a thorough training in general physics and includes the solution of numerous problems. There will be two lectures, three recitations, and one laboratory (double) period each week.

6. ADVANCED GENERAL PHYSICS PROFESSOR JONES, ASSISTANT PROFESSORS ANTHONY ZELENY AND ERIKSON

Six credits (seven hours per week) Second semester
Open to sophomores, juniors, and seniors, who have completed course 5; the laboratory fee is three dollars; intended for those students who wish to specialize in the science, to teach the subject, or to enter upon a technical course.

Light, electricity and magnetism. This course completes the work in general physics. There will be two experimental lectures, three recitations, and one (double) laboratory period each week.

7. ELECTRICAL MEASUREMENTS ASSISTANT PROFESSOR ANTHONY ZELENY

Three credits (five hours per week) First semester
Open to juniors and seniors who have completed courses 5 and 6; the laboratory fee is five dollars.

The course aims to give a thorough practical knowledge of electrical instruments and the fundamental electrical measurements. The system of electrical units is developed theoretically and experimentally. There will be two (double) laboratory periods each week, the class being divided into sections for that purpose.

8. PHYSICAL MANIPULATION AND LABORATORY TECHNIQUE PROFESSOR JOHN ZELENY

Three credits (six hours per week) Second semester
Open to juniors and seniors who have completed courses 5 and 6; the laboratory fee is three dollars; especially valuable to those who intend to teach the science or to specialize in it.

The object of this course is to give the student a knowledge of the essential physical manipulations (such as the cleaning and distilling of mercury, soldering, glass blowing, glass cutting, glass grinding, making of quartz fibers, etc), and to acquaint him with the use of some instruments of precision (such as the cathetometer, the dividing engine, the balance, mercury air pumps and gauges, etc.)

9. DYNAMICS PROFESSOR JONES

Three credits (three hours per week) First semester
Open to juniors and seniors who have completed courses 5 and 6, and mathematics 6 and 7 (calculus).

A discussion of some problems in dynamics which are important in the study of advanced physics.

10. ADVANCED PHYSICAL MEASUREMENTS PROFESSOR JOHN ZELENY

Three credits (six hours per week) First semester
Open to seniors and graduate students who have completed courses 5 and 6; the laboratory fee is three dollars.

The course consists of individual work in the laboratory on topics specially chosen to serve best the needs and capacity of each student. The course is intended to introduce the student to some of the more intricate physical measurements and to teach him self-reliance.

11. ADVANCED PHYSICAL MEASUREMENTS PROFESSOR JOHN ZELENY

Six credits (twelve hours per week) First semester
Open to seniors and graduate students who have completed courses 5 and 6; the laboratory fee is five dollars.

The same as course 10 except that twice as much time is devoted to the subject.

13. ELECTRICAL MEASUREMENTS OF PRECISION ASSISTANT PROFESSOR

ANTHONY ZELENY
Three credits (six hours per week) Second semester
Open to seniors who have completed course 7; the laboratory fee is three dollars; intended for electrical engineering and scientific students who desire to specialize in electrical work of the highest precision.

The course is chiefly experimental and includes the following: making of standard cells; calibration of Wheatstone box bridge; adjustment of resistances, ammeters, and voltmeters; use of the potentiometer in measurements of highest precision; experimental problems involving capacity, inductance, and magnetic flux; measurement of temperatures by electrical methods.

FOR GRADUATES

12. **THE THEORY OF LIGHT** PROFESSOR JONES
 Three credits (three hours per week) Second semester
 Open to graduate students who have completed courses 5 and 6,
 and mathematics 6 and 7 (calculus).
 A study of the important optical phenomena. Preston's *Theory of Light* is used as a text.

14. **RADIO-ACTIVITY** MR. KOVARIK
 Six credits (three hours per week) Both semesters
 Open to graduate students who have completed courses 5 and 6.
 The course consists entirely of lectures, experimental and descriptive. The various theories and the methods of investigation are fully considered.

15. **ADVANCED PHYSICAL MEASUREMENTS** PROFESSOR JOHN ZELENY
 Three credits (six hours per week) Second semester
 Open to seniors and graduate students who have completed courses 5 and 6; the laboratory fee is three dollars.
 The course is the experimental study of some physical phenomena, the nature or laws of which are not yet understood.

16. **ADVANCED PHYSICAL MEASUREMENTS** PROFESSOR JOHN ZELENY
 Six credits (twelve hours per week) Second semester
 Open to seniors and graduate students who have completed courses 5 and 6; the laboratory fee is five dollars.
 The same as course 5, except that twice as much time is devoted to the subject.

17. **THE KINETIC THEORY OF GASES** ASSISTANT PROFESSOR ERIKSON
 Three credits (three hours per week) Second semester
 Open to graduate students who have completed courses 5 and 6,
 and mathematics 6 and 7 (calculus).
 This course is a study of Meyer's *Kinetic Theory of Gases*.

18. **DISCHARGE OF ELECTRICITY THROUGH GASES** PROFESSOR JOHN ZELENY
 Three credits (three hours per week) First semester
 Open to graduate students who have completed courses 5 and 6,
 and mathematics 6 and 7 (calculus).
 The course consists of lectures, with experimental illustrations, on the conduction of electricity through gases. A study is made of the conductivity imparted to gases by the action of X-rays, ultra-violet light, radioactive substances, and glowing metals; of the discharge of electricity from points and in vacuum tubes; and of the spark and arc discharges. The methods of measuring the velocity of the ions and the charges carried by them are studied in detail.

19. **THE MATHEMATICAL THEORY OF ELECTRICITY AND MAGNETISM** PROFESSOR JOHN ZELENY
 Three credits (three hours per week) Second semester
 Open to graduate students who have completed courses 5 and 6,
 and mathematics 6 and 7 (calculus).
 This course consists in the study of J. J. Thomson's *Elements of the Mathematical Theory of Electricity and Magnetism*.

POLITICAL SCIENCE

FOR UNDERGRADUATES AND GRADUATES

2. **COMPARATIVE GOVERNMENT** MR. ALLIN
 Three credits (three hours per week) First semester
 Open to those who have completed course 1.
 A description and analysis of the government as the agent of the state; a comparative study of the organization and working of the governments of the great European powers of today, especially of France, Germany, Great Britain and Italy. Text, with lectures and assigned readings.

3. THE ELEMENTS OF JURISPRUDENCE

Three credits (three hours per week)

Open to those who have completed course 1.

A study of those human relations requiring legal regulation considered from the American point of view; the nature and source of law, status, rights and wrongs, partnership, corporations, etc. The course is intended for active citizenship and for the study of law. The student will practice looking up cases and summarizing leading principles. The course is based on a text, with lectures and assigned reading.

7. MUNICIPAL ADMINISTRATION

Three credits (three hours per week)

Open to those who have completed course 1.

A comparative study in modern city charters and methods of administration, the relation of the city to the state, the delimitation of its sphere of activity, its liability for tort, and an investigation into the causes of municipal corruption and merits of proposed reforms. A text, lectures, and special topics.

8. THEORY OF THE STATE

Three credits (three hours per week)

Open to those who have completed courses 1 and 2.

A study in the theory of the state, its origin, nature, purpose and justification, the elements of population and territory. Important theories, like the divine, contract, modern socialistic, individualistic, and social welfare, are considered; also the question of state interference and state management of industries. This course includes a study of classification of law, governments, and states. A text-book, with lectures and topical readings.

9. POLITICAL PARTIES

Two credits (two hours per week)

Open to those who have completed courses 1 and 2.

An advanced course in political parties, their origin, development, and function. Such topics as methods of making nominations, securing minority representation, the recall, the initiative and referendum are taken up. Text, lectures, and special topics.

10. DIPLOMACY

Two credits (two hours per week)

Open to those who have completed course 1.

The object of this course is to outline the growth of international relations, the mode of conducting foreign affairs, the relation of the treaty-making power to legislation, the duties and immunities of diplomats, the consular service, the framing, interpretation, and termination of treaties and compacts, and the character and procedure of courts of arbitration. A survey will be made of the history of American diplomacy and of contemporary international politics. Text, lectures, and supplementary reading.

12. COLONIAL ADMINISTRATION

Three credits (three hours per week)

MR. ALLIN

Second semester

Open to those who have completed courses 1 and 2.

This course embraces a discussion of the principal classes of colonies, the causes of colonization, the social, economic, and political tendencies of colonial development, imperial relations, preferential trade, and independence. A study is made of the political systems of modern colonial governments, of the organization and administration of the Spanish, English, French, Dutch, German, and American colonies. Lectures, assigned reading, and special topics.

13. TEACHER'S COURSE IN GOVERNMENT

One credit (one hour per week)

Second semester

Open to students of suitable preparation who intend to teach

American government in the secondary schools.

Lectures and the examination of text-books, maps, and other materials useful to teachers.

15. STATE AND LOCAL ADMINISTRATION

Two credits (two hours per week)

PROFESSOR SCHAPER

Second semester

Open to those who have completed course 1.

A special course in the problems of our state and local governments; a comparative study of new experiments in legislation and administration, the workings of our courts, the jury system, and the new state police. Lectures, cases, and special topics.

FOR GRADUATES

4. AMERICAN CONSTITUTIONAL LAW PROFESSOR SCHAPER
 Four credits (two hours per week) Both semesters
 Open to those who have completed courses 1, 2, and 8; both
 semesters must be completed before credit is given for the first
 semester; given in alternate years; not offered in 1908-9.
 This is an advanced course in the study of the principles of our constitutional law based on important Supreme Court decisions and standard works.

5. INTERNATIONAL LAW MR. ALLIN
 Six credits (three hours per week) Both semesters
 Open to those who have completed courses 1 and 2.
 This course treats of the nature, sources, and sanction of international law; of the general principles as developed by positive agreement, common usage, and judicial decisions, in particular of the status of nations, the rules of peace, neutrality, and war, and the arbitration movement. Text, lectures, and supplementary reading.

11. SEMINAR IN POLITICAL SCIENCE PROFESSOR SCHAPER AND MR. ALLIN
 Six credits (three hours per week) Both semesters
 Open to graduate students and seniors of suitable preparation.
 A seminar for research in the field of political science. A feature of the seminar is the discussion of current problems in politics and administration.

14. ADMINISTRATIVE LAW PROFESSOR SCHAPER
 Two credits (two hours per week) Second semester
 Open to those who have completed courses 1, 2, and 8, and to
 graduates.
 A course dealing with administration as a science, its origin and development, the law of officers under the national government, the merit system, and the growth of special administrative tribunals. Text, lectures, and cases.

SCANDINAVIAN

FOR UNDERGRADUATES AND GRADUATES

5. OLD NORSE (Icelandic) PROFESSOR BOTHNE
 Four credits (two hours per week) Both semesters
 Open to those who have completed courses 1 and 2, or 3 and 4,
 and to other qualified students with the approval of the department.
 Grammar and reading. *Gunnlaugs Saga Ormstungu*.

6. MODERN NORWEGIAN LITERATURE PROFESSOR BOTHNE
 Six credits (three hours per week) Both semesters
 Open to those who have completed courses 1 and 2; both
 semesters must be completed before credit is given for the
 first semester.
 History of Norwegian literature from 1814 to the present day. Special attention paid to Björnson and Ibsen.

7. SWEDISH LITERATURE PROFESSOR STOMBERG
 Six credits (three hours per week) Both semesters
 Open to qualified students upon the approval of the department;
 both semesters must be completed before credit is given for the
 first semester.
 History of the literature and study of modern authors, including Selma Lagerlöf, Geijerstam, Strindberg.

8. IBSEN PROFESSOR BOTHNE
 Two credits (two hours per week) First semester
 Open to qualified students upon the approval of the department.
 Lectures and readings.

9. HISTORY OF NORTHERN EUROPE PROFESSOR STOMBERG
 Six credits (three hours per week) Both semesters
 Open to juniors and seniors; no knowledge of the Scandinavian
 languages is required.
 The course includes the history of the Scandinavian countries from the earliest period to recent times.

FOR GRADUATES

12. MODERN SWEDISH LANGUAGE AND LITERATURE
13. HISTORY OF THE SCANDINAVIAN LANGUAGES
For courses in Scandinavian philology, see the statement of the department of comparative philology.

SEMITIC LANGUAGES

FOR UNDERGRADUATES AND GRADUATES

1. ELEMENTARY HEBREW ASSISTANT PROFESSOR DEINARD
 Six credits (three hours per week) Both semesters
 Open to sophomores, juniors, and seniors; both semesters must be completed before credit is given for the first semester.
 First semester, Harper's *Elements of Hebrew* and reading of easy prose passages from the Old Testament; second semester, critical reading of some book of the Old Testament and a review of Hebrew grammar.

2. ELEMENTARY ARABIC ASSISTANT PROFESSOR DEINARD
 Six credits (three hours per week) Both semesters
 Open to those who have completed course 1; both semesters must be completed before credit is given for the first semester.
 First semester, Socin's *Arabic Gramar* and the reading of the prose sections contained in it; second semester, selected suras from the Koran and a review of Arabic grammar.

3. ELEMENTARY ARAMAIC OR SYRIAC ASSISTANT PROFESSOR DEINARD
 Three credits (three hours per week) Second semester
 Open to those who have completed course 1.
 The course is based upon Strach's *Grammatik des Biblischen Aramaisch* or Brockelman's *Syrische Grammatik*.

4. HISTORY OF THE HEBREWS TO THE CLOSE OF THE PERSIAN PERIOD ASSISTANT PROFESSOR DEINARD

FOR GRADUATES

1. CRITICAL STUDY OF ONE OF THE FOLLOWING OLD TESTAMENT BOOKS
Isaiah, The Minor Prophets, The Psalms, or Job. ASSISTANT PROFESSOR DEINARD
2. EARLY ARABIC POETRY
And the relation of the Arabic, grammatically considered, to the Hebrew. ASSISTANT PROFESSOR DEINARD
3. READING OF THE ARAMAIC PORTIONS OF THE OLD TESTAMENT
And a review of Aramaic grammar. ASSISTANT PROFESSOR DEINARD
4. HISTORY, PROPHECY AND THE MONUMENTS
Studies in the early history of the Semites. ASSISTANT PROFESSOR DEINARD

SOCIOLOGY

FOR UNDERGRADUATES AND GRADUATES

5. SOCIAL GROUPS PROFESSOR SMITH
 Three credits (three hours per week) First semester
 Open to those who have completed course 1.
 An examination of the clan and the village in primitive life, a study of demography to discover the effect of environment upon social organization, and a comparison with the nature of and reasons for the modern city.

6. **THE STUDY OF INSTITUTIONS** PROFESSOR SMITH
 Three credits (three hours per week) First semester
 Open to those who have completed course 1.
 The genesis of custom and the beginnings of law with the geographical and race influence in the growth of states will be studied as well as the various forms of the family and their relation to forms of civilization.

7. **ANTHROPOLOGY** PROFESSOR JENKS
 Three credits (three hours per week) First semester
 Open to juniors and seniors.
 This is an elementary course studying the essential characteristics of mankind and the general features of the several races of men. It also investigates the origin and development of the series of activities and various institutions which have had their beginnings in primitive society. Text books, lectures, assigned readings, and thesis.

8. **ETHNOLOGY** PROFESSOR JENKS
 Three credits (three hours per week) Second semester
 Open to juniors and seniors who have completed course 1, 2, or 7, and to graduate students.
 This is a study of the different races of men in America, Europe, Asia, Africa, and Oceania; the various historical classifications of men into races are presented; the causes of the origin and distribution of the several races and subraces are sought, and from historical perspective and present indications an attempt is made to judge of the future development of races; ethnological problems are also presented. Text-books, lectures, assigned readings, and thesis.

9. **THE PHILIPPINE PEOPLE** PROFESSOR JENKS
 Three credits (three hours per week) Second semester
 Open to juniors, seniors, and graduate students.
 This course presents the geography, natural resources, and ethnology of the Philippine Islands. A careful comparative study of the four large ethnic and culture groups of people is made; tropical influences are noted; the present policy of the Insular Civil Government is outlined, so far as it tends to modify the natural characteristics and modern culture of the inhabitants, and to affect American home interests in the orient. This course aims to present a practical model for the investigator of human culture, and to introduce students to oriental race problems; it will also better fit students for government business or missionary service in the orient. Lectures, illustrated lectures, assigned readings, and thesis.

10. **PHYSICAL ANTHROPOLOGY** PROFESSOR JENKS
 Three credits (three hours per week) Second semester
 Open to juniors and seniors who have completed course 7 or 8, and to graduate students.
 This course studies the physical variations in the human body. It pays special attention to those variations which distinguish one race or group of men from another; and it seeks the cause and significance of such variations. It also attempts to trace the physical evolution of the human body and to forecast its future, studying both its development and decline. Six lectures on the development and anatomy of the human brain are given by Dr. Charles A. Erdmann of the medical faculty. This course is of prime importance to advanced students preparing for the medical course. Lectures, laboratory work, assigned readings, and thesis.

11. **THE AMERICAN NEGRO RACE** PROFESSOR JENKS
 Three credits (three hours per week) Second semester
 Open to juniors, seniors, and graduate students; not given in 1908-9.
 This course begins with a study of the negro's African tribal kinsmen and traces the rise and development of the American negro race from the birth of American slavery. The present characteristics, traits, and conditions of the negro are especially considered. The developing tendencies of the negro are studied for the purpose of considering the probable future of the American negro race. Lectures, assigned readings, and thesis.

12. **THE AMERICAN PEOPLE** PROFESSOR JENKS
 Three credits (three hours per week) First semester
 Open to juniors, seniors, and graduate students.
 This course presents the distribution in the United States of the different peoples of the world found here. It seeks the natural genius of the peculiar home development of these peoples, and notes the modifications of this development in America, thus portraying the ethnic contribution of each to

American civilization. It aims to discover the dominant physical, mental, and moral characteristics of each people, and attempts to determine the relative ethnic and culture importance of each to the nation.

13. **BIBLICAL SOCIOLOGY** PROFESSOR SMITH
 Three credits (three hours per week) First semester
 Open to juniors, seniors, and graduate students.
 Lectures, and the Old Testament as a text book.

14. **MODERN SOCIAL INSTITUTIONS** ASSISTANT PROFESSOR REEP
 Three credits (three hours per week) First semester
 Open to those who have completed course 7.
 The fundamental social institution, the family, will be studied, as also the development of modern industrial, political, educational, and ecclesiastical institutions in their relation to human progress.

STRUCTURAL ENGINEERING

FOR UNDERGRADUATES AND GRADUATES

14. **STRUCTURAL DESIGN** PROFESSOR CONSTANT, MR. KESNER
 Five credits (ten hours per week) First semester
 Post senior. Open to students who have completed courses 12 and 13.
 Theory and design of steel structure, including mill buildings, railway and highway bridges, standpipes and towers and other problems of structural interest. Lectures, problems and design. Merriman and Jacoby's Roofs and Bridges, Part III, Standard Specifications.

15. **STRUCTURAL DESIGN** PROFESSOR CONSTANT, MR. KESNER
 Five credits (ten hours per week) Second semester
 Post senior, continuation of course 14, C. E.
 With special reference to the design of a steel railway bridge and the theory and design of steel arch bridges. Lectures, problems and designs. Merriman and Jacoby's Roofs and Bridges, Part IV.

17. **MASONRY CONSTRUCTION** PROFESSOR CONSTANT
 Four credits First semester
 Post senior, preparation required course 12, C. E.
 Foundations, design and use of cribs, cofferdams and pneumatic caissons, pressure of earth, design of retaining walls, piers, abutments, dams and chimneys. Properties of stones, bricks, cement and concrete. Recitations and lectures, three hours per week; drawing room work, four hours per week. Fowler's Deep Foundations; Taylor and Thompson's Concrete and Reinforced Concrete; Howe's Retaining Walls for Earth, and current periodical engineering literature.

18. **REINFORCED CONCRETE** PROFESSOR CONSTANT
 Three credits, (six hours per week) Second semester
 Post senior. Preparation course 17, C. E., optional.
 Theory and design of reinforced concrete beams, slabs and columns, application of reinforced concrete to buildings, dams, retaining walls and arches. Lectures, problems and design. Turneaure and Maurer's Principles of Reinforced Concrete.

FOR GRADUATES

16. **SWING BRIDGES** PROFESSOR CONSTANT
 Four credits, (eight hours per week) Second semester
 Post senior, C. E. course.
 Theory and design of swing and bascule bridges, with special attention to the design of the operating machinery. Moving structures. Lectures, problems and design. Merriman and Jacoby's Roofs and Bridges, Part IV. Reference works on machine design. Students intending to take this course are advised to elect machine design, 13 M. E., first semester, senior year.

19. **HIGHER STRUCTURES** PROFESSOR CONSTANT
 Theory and design of cantilever, suspension and arch bridges.
 Analysis of indeterminate structures and complex portal bracing. General theory of flexure and application to special problems.

Students

CANDIDATES FOR DEGREES, JUNE, 1908

FOR DOCTOR OF PHILOSOPHY—3.

Henry Anton Erikson (B. E.E. '96), Minnesota Minneapolis
Major, Physics; Minors, Physics, Mathematics.
Thesis: The Ionization of Gases at High Pressure.

Frederick Casper Miller (B. A. '03, M. A. '07), Minnesota St. Paul
Major, Political Science; Minors, History, Geology.
Thesis: History and Organization of the Police.

Olaf M. Norlie (B. A. '98, St. Olaf; M. A. '01, Wisconsin) Atwater
Major, English; Minors, Education, Scandinavian.
Thesis: The Principles of Expressive Reading, A Study of the Human Voice.

FOR MASTER OF ARTS—21

Donald C. Babcock (B. A. '07) Minnesota Grand Forks, N. D.
Major, Sociology and Anthropology; Minors, Philosophy, Psychology.
Thesis: Origin and Development of Religious Experience.

John M. Brendal (B. A. '06), Luther College, Iowa Glenwood
Major, English; Minors, Comparative Philology, Scandinavian.
Thesis: Scandinavian Influence on English.

Ernest J. Colberg (B. A. '06), Gustavus Adolphus College St. Peter
Major, English; Minors, Scandinavian, Latin.
Thesis: The Dramas of August Strindberg; Some Aspects of their Ideas and their Technic.

George Rupert Eichholzer (B. A. '07), Minnesota Owatonna
Major, Political Science; Minors, History, Economics.
Thesis: The Merit System as Applicable to the various Administrative Departments of Minnesota.

Lucius Arnold Frye (B. A. '07), Minnesota St. Paul
Major, Political Science; Minors, Economics, Sociology.
Thesis: A Suggested Method of Controlling the Public Service Corporations of Minnesota.

Grace Mitchell Groat (B. L. '99), Minnesota Minneapolis
Major, English; Minors, French, Philology.
Thesis: The Psychology of English Rhythms.

Howard H. Hare (B. A. '07), Minnesota Minneapolis
Major, History; Minors, Philosophy, Greek.
Thesis: The Transition from a Provincial to a State Government in New Hampshire.

Martin Hegland (B. A. '04), St. Olaf St. Anthony Park
Major, English Philology; Minors, Education, Philosophy.
Thesis: An Historical and Semasiological Study of some Synonyms, Nouns, Verbs and Adjectives denoting Pleasure.

Minnie L. Hills (B. A. '07), Minnesota St. Paul
Major, English; Minors, Education, Sociology.
Thesis: A Comparison of Milton and Shakspere as Thinkers and Writers.

Albert Eddy Julien (A. B. '03), Hamline University Braham
Major, Neurology; Minors, Physiology, Pathology and Bacteriology.
Thesis: The Intrinsic and Efferent Fibers of the Cerebellum.

Homer B. Latimer (B. A. '07), Minnesota Minneapolis
Major, Animal Biology; Minors, Animal Biology, Botany.
Thesis: The Lateral Line of *Polydon Spathula*.

Edward M. Lehnerts (B. S. '02), University of Pennsylvania Minneapolis
Major, Education; Minors, Botany, Geology.
Thesis: The Teaching of Geography.

Migio Miyazaki (B. A. '02), Waseda University, Japan Tokio
Major, Philosophy; Minors, Sociology, Education.
Thesis: Japanese Morality, a Criticism.

Alice M. Misz (B. A. '07), Minnesota St. Paul
Major, Botany; Minors, Animal Biology, Geology.
Thesis: A Revision of the North American Species of *Vaccinium*.

Sedona Fesenbeck Nelson (B. A. '04), University of Michigan	Minneapolis
Major, English; Minors, German, Philosophy.	
Thesis: <i>Shakspere in German Literature.</i>	
Leonard H. Pryor (B. A. '02), Minnesota	Fairmont
Major, Education; Minor, Psychology.	
Thesis: <i>A Practical Teaching of Secondary Mathematics.</i>	
Rasmus S. Saby (B. A. '07), Minnesota	Radcliffe, Ia.
Major, Political Science; Minors, Philosophy, Psychology.	
Thesis: <i>Early Railroad Legislation in Minnesota.</i>	
Conrad G. Selvig (B. A. '07), Minnesota	Rushford
Major, Education; Minors, Psychology, Sociology.	
Thesis: <i>Federal Aid to Schools.</i>	
Emma White Shellenberger (Ph. B. '00), Univ. of Iowa	St. Anthony Park
Major, English; Minors, German, French.	
Thesis: <i>Usage and History in English Idiom.</i>	
Theodore T. Stenberg (B. A. '06), Minnesota	Ormsby
Major, English; Minors, Philosophy, Education.	
Thesis: <i>The Function and Value of the Stage.</i>	
Mary C. Van Wert (B. A. '05), Minnesota	Minneapolis
Major, Animal Biology; Minors, Botany, Geology.	
Thesis: <i>A Contribution to the History of Entomology in the United States.</i>	

FOR MASTER OF SCIENCE—2.

Frank Fitch Grout (B. S. '04), Minnesota	Minneapolis
Major, Geology; Minors, Chemistry, Physics.	
Thesis: <i>The Granites and Associated Quartz Basalts of Stearns Co., Minn.</i>	
John Wilson (B. S. '03), University of Wisconsin	Minneapolis
Major, Sanitary Engineering; Minors, Bacteriology, Structural Engineering.	
Thesis: <i>Sewage System and Disposal Plant at the State Agricultural School and Experiment Station.</i>	

CANDIDATES ENROLLED FOR THE DEGREE OF DOCTOR OF PHILOSOPHY—8.

Brohaugh, George O. (B. A. '89, M. A., LL. B. '93), Minnesota	Red Wing
Major, Economics; Minors, Public Finance, Sociology.	
Thesis: <i>The Minnesota Pine Lands.</i>	
Dawney, Hal (B. A. '03, M. A. '04), Minnesota	Minneapolis
Major, Animal Biology; Minors, Anatomy, Neurology	
Johnson, Mrs. Julia M. (M. A. '05), Minnesota	Macalester College
Major, English; Minors, Latin, Philosophy.	
Kovarik, Alois F. (B. A. '04, M. A. '07), Minnesota	Minneapolis
Major, Physics; Minors, Physics, Mechanics.	
Malmin, R. (B. A. '82, M. A.), Luther College	Dacorah, Ia.
Major, Hebrew; Minors, Aramaic, Jewish History.	
Melom, C. M. (B. L. '01, M. A. '02), Minnesota	Minneapolis
Major, French; Minor, Spanish.	
Stevens, Homer W. (B. A. '02, B. L. '05, LL. B. '06, M. A. '07), Minnesota	Minneapolis
Major, Political Science; Minors, Economics, Law.	
Vickery, Roy Albion (B. A. '06, M. A. '07), Minnesota	St. Anthony Park
Major, Animal Biology; Minor, Botany.	

CANDIDATES ENROLLED FOR THE DEGREE OF DOCTOR OF SCIENCE—1.

McDonald, William (B. S. '98, Ph. D. '07), Minnesota	Pretoria, So. Africa
Major, Agriculture; Minors, Animal Industry, Horticulture.	

CANDIDATES ENROLLED FOR THE DEGREE OF MASTER OF ARTS—36.

Arten, O. O. (B. A. '07), St. Olaf	
Major, History; Minors, Education, Scandinavian.	
Barnes, Clarence H. (B. A. '07, M. A. '07), Parker College	Wells
Major, Education; Minor, Psychology.	
Brown, Harry A. (B. A. '07), Colorado	Glasgow, Mont.
Major, Education; Minor, Psychology.	
Bell, Margaret G. (B. A. '05), Minnesota	Minneapolis
Major, History; Minors, French, German.	

Burns, Kevin (B. A. '03), Minnesota	Minneapolis
Major, Astronomy; Minors, Mathematics, Physics.	
Carleton, E. C. (B. A. '98, M. A. '00), Augustina	St. Peter
Major, Greek; Minors, English, Scandinavian.	
Chapple, B. P. (B. L. '91), Minnesota	Bathgate, N. D.
Major, Education; Minor, Psychology.	
Donald, Helen D. (B. L. '06), Carleton	St. Paul
Major, Sociology; Minor, History.	
Dorrum, I. (B. A. '04), Luther College, Ia.	Fergus Falls
Major, Education; Minor, Psychology.	
Dungay, Niel S. (B. A. '04) Minnesota	Northfield
Major, Animal Biology; Minor, Geology.	
Groethe, Amos	Minneapolis
Major, English; Minors, Latin, Education.	
Hallstone, Augustus (B. A. '02), Luther College	Mabel
Major, History; Minors, Economics, Political Science.	
Hatch, E. S. (B. A. '03), Steinman College, Ill.	St. Louis Park
Major, Education; Minor, Psychology.	
Harris, James H.	
Major, Education; Minor, Psychology.	
Higbie, Edgar C. (B. A. Ed. '07), Minnesota	Canby
Major, Education; Minor, Agriculture.	
Holkesvik, Julian A. (B. A. '07), Luther College	Minneapolis
Major, History; Minors, Economics, Political Science.	
Hovda, Olaf (B. A. '04), Minnesota	Minneapolis
Major, Physics; Minor, Mechanics.	
Hutchinson, Drusilla C. (B. A. '01) Minnesota	Minneapolis
Major, History; Minor, English.	
Hutsinpillar, Florence W. (B. A. '04), Wellesley	Minneapolis
Major, Economics.	
Hyser, Alice Maude (B. A. '04), Minnesota	Minneapolis
Major, English; Minor, Philosophy.	
Jacobson, Martin L. (B. A. '03), Minnesota	Dawson
Major, Education; Minor, Psychology.	
Johnson, A. W. (B. A. '05), Minnesota	Minneapolis
Major, Geology; Minors, Animal Biology, Chemistry.	
Lurton, Freeman E. (B. S. '94, M. S. '97), Carleton	Fergus Falls
Major, Education; Minor, Psychology.	
Olson, C. O. Alexius (B. A. '95, B. L. '96, LL. B. '97), Minnesota	Minneapolis
Major, Political Science; Minors, Economics, Education.	
Palmer, Rilla W., (B. A. '07), Minnesota	St. Paul
Major, English.	
Payne, Carroll E. (Ph. B. '98), Hamline	Long Prairie
Major, Education; Minor, Psychology.	
Petterson, J. W. (B. A. '04), Luther College	St. Paul
Major, Education; Minors, English, Psychology.	
Sheldon, Eleanor (B. A. '04), Minnesota	Minneapolis
Major, English; Minors, Rhetoric, German.	
Shirer, William G. (B. A. '03), Cornell College, Ia.	Buffalo
Major, Education; Minor, Psychology.	
Thomas, William Benjamin (B. A. '03) U. of Denver, (M. A. '03) U. of Chicago	Farmington
Major, Education; Minor, Economics.	
Tressman, Conrad A. (B. A. '06), Minnesota	Minneapolis
Major, Comparative Philology; Minors, German, Education.	
True, Blanche L., (B. A. '02), Wellesley	Fargo, N. D.
Major, Comparative Philology; Minors, French, Greek.	
Trygstad, Christian (B. A. '05), St. Olaf	Rapid City, S. D.
Major, German; Minors, Latin, French.	
Van Cleve, Charles W. (B. A. '03), Ottawa Univ.	Barnesville
Major, Education; Minor, Psychology.	
Ward, Jeannette Baier (B. A. '06), Minnesota	Minneapolis
Major, English; Minor, Sociology.	
Weitzel, Grace B. (B. A. '07), Minnesota	Minneapolis
Major, Political Science; Minors, Economics, Sociology.	

CANDIDATE FOT THE DEGREE OF MASTER OF AGRICULTURE—1.

Howell, David B. (Ph. B. '06) Wisconsin	St. Anthony Park
Major, Animal Nutrition; Minor, Chemistry.	

STUDENTS TAKING GRADUATE WORK, NOT ENROLLED AS CANDIDATES FOR

DEGREES—35.

Beeler, Levi Harrison (B. A. '96), Macalester, (Ph. D. '07), Minnesota	Stillwater
Education, History, Economics.	
Bicknell, Blanche (B. A. '07), Minnesota	Minneapolis
English, Sociology.	
Burt, Henry F. (B. A. '99), Washburn College	Minneapolis
Economics.	
Campbell, Anna Jean (B. A. '07), Minnesota	Hopkins
English.	
Chamberlain, Ruth (B. A. '07), Wells College	Minneapolis
English	
Comstock, Elting H. (B. S. '97), Wisconsin, (M. S. '07), Minnesota	Minneapolis
Mechanics, Chemistry.	
Cook, Louis G. (B. A. '01), Minnesota	Minneapolis
Chemistry.	
David, John A. (B. A. '04), Bates College	St. Paul
Chemistry, Physics.	
Dean, Helen M.	Minneapolis
English.	
Finkle, Kate T. (B. A. '05), Minnesota	Minneapolis
English, Political Science.	
Fisher, Aimee W., Vassar	Minneapolis
English.	
Funk, Henry D. (M. A. '03), Minnesota	St. Paul
History.	
Gates, F. W. (Ph. B. '99), Wisconsin, (M. A. '07), Minnesota	Minneapolis
Mechanics, Mathematics.	
Haglund, D. E., Bethany College, Kans.	St. Paul
History.	
Hall, Helen (B. A. '07), Vassar	Minneapolis
English.	
Harvey, Elizabeth G.	Minneapolis
Philosophy, Mathematics, Education.	
Hill, Louise C.	Minneapolis
English.	
Landstrom, G. (B. A.), Gustavus Adolphus	Sandstone
German, Comparative Philology, Scandinavian.	
Levens, Lora, (Ph. B. '02), University of Chicago	Minneapolis
Education.	
Lien, Martin	St. Anthony Park
Education, Scandinavian.	
Link, George M. (B. S. '98), Wisconsin	Minneapolis
Shop work, Drawing.	
MacFarlane, Lorena (B. A. '03), Minnesota	Minneapolis
English, Sociology.	
Marlowe, Cora E. (B. A. '00), Minnesota	Minneapolis
English.	
Moll, Frank E.	Wahpeton
German, French, Comparative Philology.	
Quirk, Nellie	Minneapolis
English.	
Rapeer, Louis W. (B. S. '04), Chicago, (M.A. '07), Minnesota	Minneapolis
Education, Sociology.	
Richert, Cornelius (B. A. '00), (M. A. '01), Nebraska	St. Paul
Semitic, Sociology.	
Rockwell, Frank I.	St. Anthony Park
Forestry.	
Schisby, Marion (B. A.), Vassar	Minneapolis
English.	
Sedgwick, Emily W. (B. A.), Nebraska	Minneapolis
German.	
Shephard, William H.	Minneapolis
Political Science.	

Stamm, Freda L. (B. A. '07), Minnesota St. Paul
German.

Truesdell, William H. (M. A. '06), Minnesota Minneapolis
Chemistry.

Williams, Charles A. (M. A.) Minneapolis
German.

Zoerb, A. J. (Ph. B. '06), Wisconsin Minneapolis
History.



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